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THE AMERICAN GAS LIGHT JOURNAL

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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
American Gas Light Association 381

EDITORIALS—
Briefly Told 381
The Move for a Municipal Works in Chicago—Municipal Lighting Stations—Report of Department of Public Works, Phila., Pa.—Odd Lots.

Gas Distribution, by Jos. R. Thomas, C.E. 383

Increasing the Productive Capacity of Plant, by A. B. Slater 384

*Gaseous Fuel 385

The Deptford Electric Lighting Station 388

The Galloway Boiler 389

Special English Correspondence 390
The Guide-Framing of Gasholders—Another Reduction—A Threatened Strike—Gas from Tar.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 391
A New Fire Alarm Signal—A Suit against the Standard Gas Machine Company—Peculiar Methods Adopted to Dispose of Electrical Apparatus—A Natural Gas Well in New York City—Explosion at Pittsfield, Mass.—Sale of the Waterhouse Company—Married—The Laclede Company again Victorious—Ball Engine Company's Sales—Another St. Louis Suit—Resignation of Mr. W. B. Houston—Suit against a Natural Gas Company Empowered to Renew Operations in Troy, N. Y.—Public Lighting at Lansingburg, N. Y.—A Hint from Nevada, Mo.—Resignation of Mr. Roberts—Public Lighting, New Haven, Conn.—Something from Macon, Ga.—Lockport (N. Y.) Public Lighting—Sales of the Keller Coke Crusher—Natural Gas not in Columbus, Ind.—An Illustration and its Moral—Public Lighting, Galveston, Texas—Shipments of the Connelly Specialties—and Many other Items.

Artificial Portland Cement 394

CORRESPONDENCE—
Mr. Somerville Defines his Position in Respect to Self-Sealing Lids 394

Oil Fuel and Insurance 395

The Market for Gas Securities 395

[OFFICIAL NOTICE.]

AMERICAN GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY, Nov. 26, 1888.

To the Members of the Association:

Gentlemen—I am now preparing a revised list of the members of the Association, giving their addresses, and have sent a circular to each member asking for his correct address. I would be glad to have the responses at an early date.

I am also preparing for publication in book form the Proceedings of the Association for the years of 1887 and 1888, and would be glad if the members would examine the minutes as they have been published and notify me promptly of any errors or omissions. Yours truly,

C. J. R. HUMPHREYS, Secretary.

BRIEFLY TOLD.

THE MOVE FOR A MUNICIPAL GAS WORKS IN CHICAGO.—Great is Chicago, and beyond a doubt she will be yet greater when the census man who completes the labor of counting her denizens during the year marking the completion of the nineteenth century shall have rendered an account of that enumeration. And the close observer of her municipal records and history may, perhaps, take heart of hope that her municipal rulers of a decade hence shall also have kept pace with the city's expansion; a hope that may reasonably be entertained, for the future ruler will not have an exceedingly hard task to show that he is an improvement on his predecessors of, say, a half decade ago. In fact, one might easily be forgiven for asserting that any type of ruler to be developed there in the future could not fail to be an advance, morally and socially, over the original Jacobs of even the immediate present. At starting, we do not wish to be understood as defending any of the financial performances which accompanied the formation of the Chicago Gas Trust, for some of these will hardly stand exposure, much less explanation, when brought into the calm light of investigation impartially conducted; but these performances, traced out to the cause which made them possible, are measurably excusable in that the trail inevitably leads to the doors (if not inside the very precincts) of the City Council chamber. Capital is insinuating, and frequently betrays a sad lack of familiarity with the principles which are supposed to underlie the practice of the unco guid; neither does it seem particular in its choice of those whom it enlists as agents. Aside, however, from reveries of this nature, it would seem as if capital had suddenly chilled (there is no accounting for its erratic changes from heat to chill and vice versa) in its advances to the Chicago Council. In the past decade, when applications for opposition gas charters seemed to bob up serenely in the proper municipal quarters of Chicago—roughly speaking, at least one a year was acted on—it was worth something to be a Councilman. No matter how the application fared, the Councilman always fared well. If the applicants were financially strong and financially liberal, the petition was quite likely to be granted; but if the financial strength and liberality of those already in possession of the field were in excess of like qualities possessed by the applicants, the latter were likely to find the virtuous side of the Council presented to their consideration. And so the contest

waxed and waned. People's and Consumers' and Equitable Gas Companies were formed to lead the gas consumer out of the snarl in which he was firmly held by the pioneer gas suppliers. As admitted above, capital is insinuating; but it is also conservative, and decidedly so. Chicago with all her greatness had limits—to her capacity for absorbing artificial gas as well as in other directions; and the People's and the Consumers' and the Equitable corporations found this fact out about as soon as anyone else in the Windy City. Then capital experienced a chill, and the wallets of the Councilmen shrunk with dismay. The gas men put their heads together, and also their forces; a grand scheme of amalgamation was perfected, and the whole was nicely blanketed with a thick, warm covering of bonds and stock. This attended to, the price of gas was put at a figure which would cause capital (outside capital, that is) to think twice ere it made a visit to the one-time alluring vicinity of the Council chamber. And now did the Councilman feel his impotence. The merry days of chartering were over, and the amalgamated Company cheerily snapped its fingers at the agents who, when it was in a segregated state, often dallied with its then separate members.

Nevertheless, the Chicago Councilman is fertile in expedient and bold in execution, and he would have at least one more attempt made to let down the bars which separate him from the green fields wherein he was wont to revel. With this as a prelude, we here introduce Ald. Campbell's resolutions seeking to embark Chicago on the seas of municipal gas supply:

"*Whereas*, It is the judgment of this Council that our citizens should no longer be subjected to the demands of the Gas Trust or other private corporation for light and fuel, but should be supplied by the city at the lowest possible cost and upon the same basis that our people are now supplied with water; therefore be it

"*Resolved*, That the Law Department be and it is hereby directed to report to this Council at its earliest possible convenience what legislation is necessary, if any, to enable the city to provide the funds necessary to establish a gas plant for supplying our citizens with gas for fuel and power purposes, as well as for lighting the city."

Virtuous Ald. Campbell; economical Ald. Campbell; converted Ald. Campbell. How much better it would be for you, though, if certain passages in your relations to the Billings interest could be wiped out; to say nothing of the same passages in connection with the Consumers deal. We fear, however, that the present flash in the pan will not prove very profitable to Ald. C. and his confreres. They made the mistake, like our famous New York Legislature of "some short years ago," of going too fast and too far in their operations. Too many cooks spoil the broth, and too much seasoning destroys the dish. Likewise, too many charters curtail the gas field, no matter how boundless at first glance its possibilities seem. To sum up, the present move is nothing more nor less than a strike, an opinion that is freely shared in by the newsmen of Chicago, as the following, from the *Times*, of that city, will attest:

"So far as the public is concerned there will be nothing of profit in the proceeding. The legislators, in the meantime, will get some satisfaction out of the winter's work, if nothing else." They (the legislators) may get satisfaction, but it is extremely improbable that they will get anything more substantial.

MUNICIPAL LIGHTING STATIONS.—This Chicago suggestion of operating a municipal gas works also brings to mind the fact that many other municipalities cast longing eyes in a like direction; although the record shows that the municipal lighting penchant leans toward the installation of arc lighting plants rather than to the maintenance and operation of gas works. In fact several strikingly important examples of municipal electric lighting installation are now before us. There seems to be something peculiarly catching to the average councilmanic mind in the argument made by the touters of the various parent or home electric apparatus and supply companies. The touter, who is usually intelligent and invariably glib, having secured the ear of Ald. So-and-so, soon convinces the latter that the town of Risington is very far behind the age, in that arc lights are not nightly blazing over every portion of the place, not even excluding those sections over which run the furrows and hillocks that in last season's farming practice marked the bed of the cabbage and the home of the tomato vine—for was not "Farmer's Addition" drawn into the town limits when the last cabbage in it was turned upside down in the waning days of October.

The touter, of course, asserts that his trainers (meaning the parent company) will gladly accept a contract to put in a plant at their own risk and maintain many arcs of any candle power for so much per night each; but they would prefer to sell to the town a plant complete, whereby the latter could not only obtain high candle power arcs, but also have them at a price that would be minus the profit reaped by the independent company under the first proposition. Ald. So-and-so's great brain responds to the dynamic pleadings, and asks for figures—those truth on-their-face characters—whereupon the treasury of the town is endangered. Once the touter is started on this track, So-and-so's doom is sealed; for if the touter has any stronghold, the citadel is built on arithmetical foundations. Like the victim who has been weak enough to address a second phrase to the special agent of a life insurance company, particularly if that special is engaged in unfolding the beauties of an endowment policy, So-and-so now enjoys but little repose. The touter speaks of lights per horse power, pounds of coal and foot pounds; beauties of the municipal system; perfect freedom from the twists and turns of grasping monopolists, and all the rest.

Meeting night arrives, So-and-so arises; "Mr. Chairman (unless, indeed, as is frequently the case, So-and-so is the Chairman) "to speak to a question of grave importance," etc. When the importance of the subject has been duly and windily ventilated a committee is appointed, and then fine work of another nature is resorted to—if necessary. After a while the committee reports in favor of making a contract with the "Great and Only Electric Dynamic Company," of ——, for the purchase of a complete arc lighting outfit at so much, to be paid in so many installments, when the plant shall have been in working operation for such a length of time. Then our "touter" hies him away to another bucolic district, where a similar game is instituted.

Seriously, this practice of committing cities and towns to the operation of municipal arc lighting plants has been shown to be devoid of economy. A striking instance of the truth of this statement was given in our last issue, when the inadequacy of the Little Rock (Ark.) plant, foisted on that city by the obstinacy or revengefulness of Mayor Whipple, was exposed. But that the practice is gaining ground there can be no doubt.

Following the Pawtucket, R. I., attempt comes the one at Bangor, Me., where an "electrical expert" has advised the authorities that an arc plant (capacity, 130 arcs, of 2,000-candle power each, to be maintained by water power) can be installed, complete, for $17,000, and that the annual cost to the city for each light will not exceed $23.20. The "expert" who would submit as true such figures as these must be relegated to the fool class. He, however, probably belongs to a much smarter, though much meaner, grade of humanity. Other examples might be given, but these will suffice for the present.

SECRETARY HUMPHREYS seems to be appreciated at home as well as abroad, judging by the recent action of the Board of Directors of the Lawrence (Mass.) Gas Company. He deserves his good fortune.

DIRECTOR WAGNER, of the Department of Public Works, Philadelphia, is to be congratulated on the capacity of some of his subordinates, and of the latter he has no more praiseworthy adjutant than Chief Park, of the gas division of the Quaker City, and this verdict will be shared in by all who examine the Chief's report regarding the conduct of his Bureau for the year 1887, for a copy of which we are indebted to Director Wagner. For instance, the make per pound of coal, which in 1886 was 4.54, was brought in 1887 up to an average of 4.79. This gain, reduced to money values (with gas at $1.50 per thousand), means just $153,414.50, without making any mention of the larger quantity of coke left for sale. This shows whether or not the moneys expended in bettering the condition of a portion of the retort house system were expended wisely. The total gas product for the year was 3,154,842,000 cubic feet, or an increase of 7.07 per cent. over the preceding twelvemonth. The entire product since the establishment of the works is returned at 51.25 billion cubic feet. The maximum daily output for the year was reached on Dec. 24, when 13.50 million cubic feet were distributed. Chief Park's report contains much that is of interest to the fraternity.

AN explosion in the purifying house of the gas works owned and operated by the Pennsylvania Railroad system, at Crestline, Ohio, caused great damage to the plant. An employee named Blanford was seriously injured.

ODD LOTS.—Mr. V. L. Elbert, who had been in charge at Minneapolis (Minn.) for some years, is now superintendent of the Los Angeles (Cal.) Company.——Evanston (Ills.) is having trouble with stoppages in pipes and burners since the starting up of the water gas plant.——The proprietors of the Goshen (Ind.) Company are very much pleased with the water gas plant recently put up for them by Henry Pratt.—The North and South divisions of the city of Chicago have recently adopted the Sugg steatite governor burner for the street lamps. The plant was furnished by the American Meter Company.

[A paper read before the Society of Gas Lighting.]

Gas Distribution.

By Jos. R. Thomas, C.E.

Among the numerous papers that have been read before this and kindred associations very few treat on the subject of gas distribution. Why this should be so we are not prepared to say; for it is in our estimation a matter of the utmost importance, and one that requires careful manipulation in all its details, where the business affairs of a gas company are to be administered with economy and success.

In treating upon the subject in this paper, however, we shall confine ourselves more particularly to street mains and service pipe. Of course there are many other things requisite for the economical distribution of gas, but it must be conceded that the street mains and services always play the most important part; for if these appliances are not in good condition loss from leakage must be large, hence the necessity of having all work of this kind performed in a careful and thorough manner, so that the loss of gas in distribution may be reduced to the minimum and the successful working of the company be assured thereby, in a measure at least. To accomplish this object it is necessary that all the labor on street mains and services shall be the best obtainable, and also that the materials used shall be of the highest quality; for if these precautions are not strictly maintained a constant loss of gas by leakage must be the result, and economy in distribution is out of the question.

We frequently hear of a loss of gas from leakage, or of gas unaccounted for, of 20 to 30 per cent. of the entire quantity manufactured; in fact, in many instances, the maximum figure given is often exceeded. That a reformation is surely called for under such conditions all will admit; and to accomplish such reformation a thorough overhauling of street mains and services will prove an actual necessity, if the situation is to be changed and the defects remedied. The following out of such a course and putting these appliances in proper condition will most probably contribute more than any other thing in practically assisting in the solution of the problem of how to distribute gas with the lowest possible leakage.

Wherever the loss by leakage is excessive the matter should be at once taken in hand. Learn what is necessary to prevent it, and then have it attended to, even if it is requisite to make the most radical changes to carry out the object in view. Success must attend well-directed effort, and the company, in its changed position of affairs, be ultimately benefited by an increase in its profits; for saving is equal to earning.

To appreciate the gravity of the loss mentioned above, we must remember that a loss of 20 per cent. of gas in distribution means one-fifth of the product, while 30 per cent. represents three-tenths of the same. Looking at it thus it is self-evident that a change from this condition of affairs is absolutely necessary for a company's prosperity. In whatever way or manner this can be brought about by the reduction of the loss within reasonable bounds the better it will be for those interested.

In many instances of which we are cognizant the labor on street mains and services has been done by contract, and frequently has it been the case that not only the labor but also the materials have been so supplied. Under such circumstances we cannot expect to secure work and material of the best character. Contractors are only human, and the disposition on the part of many is to furnish both labor and material of a poor kind and quality. The pipe is almost invariably light in weight, while the work of trenching, laying, jointing, etc., is performed in a hurried and careless manner; the desire being not so much for good and thorough work, but rather that a large amount of it may be finished in a short time, and at the lowest cost.

Pipe of poor quality, either for street mains or services, an improper or slipshod manner of placing them in the ground, and the jointing not performed in suitable manner, are all important factors in causing excessive loss of gas by leakage; therefore, while having such work in hand, those in charge thereof should exercise the most careful supervision. They should see to it that all pipe used is of good quality and proper weight, and that when being placed in the ground all the necessary work is carefully and thoroughly done in every particular. If this is properly attended to, when the pipes are finished and in their places, they will remain in good condition for a long time, unless disturbed and dismembered by the festive plumber or sewer man, or some other heathen having a normal antipathy to pipes in general.

One thing deserving careful consideration in regard to street mains is that after they are placed in the ground, with all the work upon them completed, they are at once buried out of sight. Afterward, should leakage occur, either from the use of poor material or inferior workmanship, such leakage can alone be detected by the gas permeating the earth and rising to the surface. This of itself is sufficient to impress upon us the necessity of doing this work in the very best manner, every precaution having been taken to make it permanent and lasting.

In very many instances where excessive loss from leakage is reported, we think it can be readily accounted for, and to call attention to one fruitful source we mention the following in respect to the pipe frequently used for distributing gas. It is a well-known fact that such pipes are made and sold of almost any thickness that will hold together in casting. Wrought iron pipe for services is also manufactured with the same lean dimensions, and although too thin in their texture for ordinary house work are frequently used for street services. Where pipe of this sort has been employed it is unnecessary to look further for the cause of the excessive leakage. At least, we think not; and if those having any such pipe in use will examine them carefully we are fully convinced they will coincide with this opinion. Light weight pipe costs less than the heavier article; but it is well to remember that this is simply in regard to the pipe alone. Trenching, jointing and other expenses will be equal, whether the pipe be heavy or light in weight; so the saving of a few pounds of iron in the length of a pipe will not prove so important an economy as many seem to believe. Especially will this prove to be the case where good work and material are to be the rule and not the exception. Pipe must be of sufficient thickness to permit of its being drilled and tapped properly; and where there is thickness there must of necessity be weight. If by skinning the pipe—for lack of a better term—the weight is brought below what it ought to be to manufacture a good article, its cost may be less as to first outlay, but its use will ultimately prove far from economical.

We learn, from the report of the Gas Commissioners of Massachusetts for the year 1887, that the unaccounted-for gas in that State varied in quantity between these extremes: Maximum, 40.86 per cent.; minimum, 1.66 per cent. This is certainly a remarkable difference to be placed on record, and intimates that somebody ought either to do a great deal of grubbing, or seek a vocation other than the one at present engaged in.

While it will be admitted that the minor loss reported is very exceptional and rarely reached in gas supply, still on the other hand it must also be conceded that the major loss is abnormally high, and can only prove disastrous to the company working under such conditions. In proof of this, suppose we assume that 6 per cent. of the product would be about a fair loss in distribution; we can then see where excessive loss will lead to in the revenue account. Let us take the initial price at which gas is sold at $1.50 per thousand, then we can obtain the value of the product, under various percentages of loss, as follows:

Price of Gas at	Per Cent. Loss.	Value.
$1.50 per M	6	$1.41
" " "	10	1.35
" " "	15	1.27½
" " "	20	1.20
" " "	25	1.12½
" " "	30	1.05
" " "	35	.97½
" " "	40	.90

Thus we find the difference in the receipt of a company, with what would be considered a fair loss and that of another with an excessive one, to be 51 cents on every 1,000 cu. ft. of gas accounted for. It goes without saying that radical changes are here demanded to place the losing company on a better footing than that now occupied by it. It would be much more business-like to remedy the existing defects that cause this loss, save the gas now lost by so doing, and give the consumer the benefit by reducing the price to him, rather than to continue on in the present dog-in-the-manger policy.

Following the above remarks we herewith present a schedule of weight for pipe of different diameters, feeling confident that the more closely the figures are adhered to the better will be the eventual result:

Diameter, Inches.	Length in feet and Inches.	Weight, lbs.
3	9	118
3	12.4½	161
4	12.4½	217
6	12.4½	328
8	12.4½	454
10	12.5	641
12	12.5	808
16	12.5	1,321
18	12.5	1,495
20	12.5	1,748
24	12.5	2,265
30	12.5	3,016

In purchasing pipe it is always best to buy by weight—*i. e.*, by the ton, giving at the same time the weight at which they are to be supplied, rejecting those that do not closely approximate to the weight specified. Pipe can be made of very even weights, where the manufacturer has the disposition to so do; therefore, when a variation in the weight from that specified

is discovered, of over 3 per cent. up to 10-inch pipe, and 2 per cent. in sizes above that, such pipe should not be accepted. Nor should any overweight, exceeding in the aggregate the multiple of the weight specified, ever be paid for.

The pipe used for distribution ought to be of ample dimension to give a quick supply of gas wherever demanded. By this means the initial pressure can be kept at the lowest practicable point, and loss caused by excessive pressure avoided.

When the pipes are placed in the trench they should always be laid in a straight line unless some unforeseen obstacle prevents.

In yarning the joints they should be made gas-tight with the yarn. This can be readily done if the work is properly attended to. When the joints are caulked the bottom or under seam should always be driven first. Better work is accomplished under this practice. In the vicinity of New York city pipe ought to have not less than 2½ feet of covering when completed.

With proper precaution pipe up to and including 12-inch can be laid with the gas on under ordinary day pressure. This permits opportunity for examining them carefully to detect any leak that may occur. The loss of gas in this manner of placing them will be but little if any in excess of that required to *b'ow them out*, or displace the air in them.

Branches with four sockets are to be preferred, as they give the opportunity of working up spigot ends of pipe. Those styled water branches are the best to use; the quarter circling from the body of branch to the arm making the outlet much larger than that from a straight arm. All outlets on pipe or branches not in use should be capped or plugged with iron bonnets or plugs.

In selecting pipe for services see that you get a good article, of proper thickness and well made. Decide upon the gauge and weight per foot you desire to have furnished, and have all bundles of pipe delivered you of this standard weight. A brass spring, for connecting service pipe to the main, with thread for main and socket for service, is essential to secure good work. These can be procured, of any size required, from the meter manufacturers.

After the mains and services are placed in the ground, the earth should be thoroughly tamped under and about them to keep them permanently in their places.

If these suggestions are given that thoughtful attention which they certainly deserve, work of the best class will be obtained. The more closely they are complied with the more satisfactory it will prove in the end; and the practice will also aid very materially in securing economy in the send-out. With mains and services of the best quality, both as to materials and workmanship, it is only fair to assume that gas will be delivered with the lowest possible loss chargeable to leakage.

[A Paper read before the Society of Gas Lighting.]

Increasing the Productive Capacity of Plant.

By Mr. A. B. Slater.

The question of increasing the productive capacity of the plant is one which we all, in some way or other, are called upon to decide, particularly in these days of greatly increased demand for gas used for illumination, cooking and heating. Works constructed 20 or 30 years ago, with the best apparatus then known, can hardly be operated with profit now; especially with the price of gas at the present ruling rates in cities of any considerable size. In a retort house, constructed after the most approved plans now, we can produce more than twice the quantity of gas upon the same ground area that we did 20 years ago, and we do it with half the number of men; so that on the question of economy we turn to the retort house as the place where, in the matter of improvements, the greatest economy may be looked for. The treatment of the gas after it leaves the retort house is now brought much nearer the standard we aim to reach, but with perhaps less difference in economy of manipulation than has been effected in the retort house. The ammonia is now more generally saved, and in some places the sulphur is made a source of revenue. The more modern apparatus used for the elimination of the ammonia, carbonic acid, sulphur compounds and tar is more effective now in this country than in former years. Twenty-five years ago it was no unusual thing to see turmeric paper instantly colored when held over a small jet of the gas.

The old rectangular "spray-washer" was beautiful in theory, but wretched in practical results. The rectangular multitubular condenser, where the gas passed alternately from one degree of temperature to another on its way through the different compartments was wrong in theory, and the result unsatisfactory. The more scientific method of gradually cooling the gas until the proper temperature is reached can now be effected by multitubular condensers, having an automatic arrangement for the regulation of the proper supply of water, according as the temperature of the gas makes it necessary to increase or diminish the quantity of water required to secure the desired result. Thus it is evident that when it becomes necessary to make improvements in an old works, whether for increasing the capacity of the plant, or for better and more economical working results, each individual case must be considered by itself: as in no two cases are the necessities and conditions exactly alike.

In this paper it is my purpose to give you a brief description of the original plant at the West Station at Providence, and then to tell you what has been done, or rather being done, to increase its working capacity. It was laid out and built some 17 or 18 years ago. The retort house consisted of 24 benches of "fives," in one double stack. The connections throughout the works were 20-in., and the whole was intended to have a working capacity of about 1,250,000 cubic ft. per 24 hours.

The gas passed from the retort house to a rectangular multitubular condenser, which was 37 ft. long, 5 ft. 6 in. wide, and 16 ft. high, with a water-sealed top. It was divided in cross section into 12 compartments, each compartment containing 24 4-in. pipes. These pipes were surrounded by water which entered the sides of the condenser at the bottom of each compartment and passed off through overflow pipes at the top of each compartment. The gas entered the first compartment at the bottom, and was met by a low temperature where the water entered the condenser, and the water being warmed by the gas, which passed directly from the hydraulic main, naturally increased in temperature until it reached the overflow at the top and passed off to the water tank.

When the gas reached the top of the first compartment it passed over, into and down the second compartment, consequently passing from a higher temperature at the top to a lower temperature at the bottom of the second compartment; and so alternating in its passage through 12 compartments from a lower temperature to a higher, and from the higher to a lower temperature, until it reached its exit from the condenser. The gas then passed through a rectangular "spray-washer," which was 36 ft. 7 in. long, 5 ft. 3 in. wide, and 12 ft. high, divided into 32 compartments, by 15 partitions placed in cross-section, and one longitudinal partition placed in the center.

The gas in passing from one compartment to another was met, or rather intended to be met, by a finely-divided spray of water in each compartment. The gas was then taken by the exhausters and passed on through the purifiers, which were four in number, each 20 ft. by 24 ft., set in a square and operated by a wet center-seal.

The gas then passed to the station meter and on to the receiving holder. The exhausters were set at a lower level than any of the other apparatus, and as the tar was never properly eliminated from the gas we were troubled with thick tar being carried over to the exhausters, and sometimes to the purifiers.

To obviate the trouble the exhausters and engines were removed to another part of the works and placed at a higher elevation, and now take the gas directly from the hydraulic main, since which time we have had no trouble.

The result of passing the gas through the washer was the use of an enormous quantity of water, which deteriorated the quality of the gas, and the water was practically introduced in streams rather than in a finely-divided spray as was intended, and so the gas was never brought intimately in contact with the water, and but a small portion of the ammonia was eliminated from the gas.

As the water was never properly diffused in the washer various expedients for rendering the water more effective for the elimination of the ammonia from the gas were tried, one of which was filling the several compartments with fine brush, which had the effect of breaking up the gas and bringing it into more immediate contact with the water. This somewhat improved its effectiveness, but as it was considerable trouble and expense to change the brush, when clogged with thick tar which entered in considerable quantity through lack of proper condensation, it was finally abandoned and a tower scrubber erected. Its dimensions were 9 ft. diameter by 50 ft. high, and filled with thin boards formed into trays, the boards of which were about 6 in. wide and about ⅜ of an inch apart, resting upon their edges. At the top was a water sprinkler, which was intended to keep the boards wet throughout the entire length of the scrubber.

The gas entered the scrubber at the bottom, passed up through between the wetted boards, and descended, through a 20-inch pipe in the center of the scrubber, to the outlet at the bottom. This proved to be more economical in the use of water, and more effective and satisfactory—removing a large portion of the tar and ammonia. A new multitubular condenser, similar to the first one, excepting that the top was tight without the water seal, had previously been added.

The next change was the construction of a stack of 20 benches of "sixes," with larger ovens (7 ft. 6 in.) and larger retorts (14 in. by 26 in.

by 9 ft.). This proved to be a decided improvement, producing much better results than had ever before been obtained.

The next change was rebuilding the arches in the stack of "fives," making two separate stacks of 8 benches of "sixes" each. The hydraulic mains being short, rendered the removal of the tar easier and with less trouble. Still later, the stack of "sixes" having been pretty thoroughly used up, it was rebuilt, making two more stacks of 8 benches each, with arches 7 ft. 6 in., and set with the Davison retorts which we had previously tried in the old stack.

These retorts gave us increased retort surface in the same arches where the 14 in. by 26 in. by 9 ft. retorts had been used, and gave us a corresponding increase in the quantity of coal carbonized and quantity of gas produced.

The Dieterich furnaces were also put into this stack, having found by trial in some of the benches of the other stack that by their use, as well as by being able to work off the charges in three hours, we added largely to the productive capacity of the benches.

The retort house has now four double stacks of 8 benches of Davison retorts each, and all heated by the Dieterich furnaces, the whole being capable, when in full working condition, of producing over 2,000,000 cu. ft. of gas per 24 hours. In 1882 the quantity of gas made at this station had reached a point where it became necessary to increase the capacity for purifying, and another set of four purifiers, 20 ft. by 24 ft., were added. These purifiers were set in line, and in place of a wet or dry center-seal Isbell's valves were used, which allows of using the purifiers in sequence, or any number of them at the same time.

During the winter of 86–87 the demand made upon this station for gas reached the capacity of the station, and it became necessary to make arrangements to meet the probable increased demand for the present winter. The retort house and the purifying capacity were ample. It being practically impossible to enlarge the connections and other apparatus throughout the other portions of the works, the question what to do must be met and answered. The addition of a water gas plant was considered, and after a careful consideration of the matter it was decided not to adopt it for for the following reasons:

First.—In order to make it successful in all respects it would be necessary to put in a complete plant, including purifying, station meter, etc., which would add largely to the cost; and as we had sufficient purifying capacity, and the two station meters were ample for the increased capacity which we required, we did not need more.

Second.—The price of naphtha or oil in Providence would make the gas cost more than coal gas; and, as has been proved in some of the larger cities, in handling a large quantity of naphtha there is always present an additional element of danger.

Third.—In making any considerable quantity of water gas to be passed through the coal gas apparatus, the conditions are such as to make it objectionable to do so. The coal gas passes the apparatus quite uniformly, and when working to its normal capacity would not take the water gas without heavy back pressure, and would blow out the seals, as the water gas is generated very rapidly, and, except when working with a series of generators, would evolve large quantities at one time and small quantities at another time. Without a complete plant, independent of the coal plant, we would not be able to work the coal plant to its capacity, thus losing any benefit which might under favorable conditions be derived from a combination of the two systems.

With these facts in mind, and seeing no special advantage in the way of economy by adopting a water gas plant, it was decided to look in some other direction for relief.

The first plan was to add sufficient apparatus to take care of about 500,000 cu. ft. of gas, in addition to the capacity of the old plant. Upon further consideration it was found that it would result only in temporary relief, and would be used but a short time in the winter. Finally it was decided that, as we wanted to make some changes and alterations in a portion of the old apparatus, we would put in a set of apparatus which would take care of a quantity of gas equal to that of the old plant—viz., 1,250,000 cu. ft. per 24 hours. Again, it could be done at once with more economy, and it would give us the advantage of using it throughout the year, thus allowing of such alterations and improvements in the old apparatus as may be deemed necessary; and, finally, to bring the whole plant up to a capacity of about 2,500,000 cu. ft. in 24 hours, which at the present rate of increase would soon be found necessary.

It has resulted in the construction of a new building and apparatus, as shown on the drawing herewith submitted. First, we have two exhausters, a Wood condenser, two multitubular upright condensers, two Walker tar and carbonic acid extractors, and two Kirkham, Hulett & Chandler ammonia scrubbers.

The apparatus is made a double set, either of which can be used separately, the whole together, or any one machine can be bye-passed and cleaned, or repairs can be made, if necessary, without stopping the works. The gas passing through the old or the new set of apparatus can be passed through either one or both sets of purifiers, as may be desired. I had hoped in this connection to give you the results accomplished by the new apparatus; but the work is not yet quite completed, so I will have to defer the matter until some future time. The exhausters take the gas directly from the hydraulic main, the horizontal connecting pipes are all below the floor, with nearly all the valve stems on the floor convenient of access in working. The connecting pipes are all well elevated in the cellar, so as to give easy drainage; and the cellar (which is 10 ft. in the clear) is well lighted.

Gaseous Fuel.

[A paper read by Mr. J. Emerson Dowson, M.Inst.C.E., before the British Association, at Bath, Eng., on Sept. 8, 1888, and reprinted from the London *Journal*.]

At the York meeting of the Association, in 1881, I had the privilege of explaining for the first time an apparatus with which I had succeeded in making a cheap fuel gas; and I gave the economical results of working some gas engines with it. Since then I have gained a much wider experience in connection with this subject; my apparatus has been considerably improved; and the gas made in it has been much used, not only for driving engines, but for heating in many industrial processes. I propose, therefore, to give a short account of the development which has taken place, and some of the more important results obtained.

Like other generator gas, mine is made by passing steam and air through incandescent fuel; and gas so made can be taken direct from the generator and burnt in a furnace without being purified or cooled. For such work large flames are used, and it is comparatively easy to deal with them. When, however, the gas is required for a gas engine or for small burners, the conditions are very different. The gas must be clean, or troublesome deposits will occur in the pipes or cocks; and it must pass through a gasholder to insure uniformity of pressure in the distributing pipes. It must also be cool; and this is especially the case for gas engines, as, within certain limits, the cooler and denser the gas, the greater is the energy in the limited volume which can enter the cylinder. It is also essential that when small jets of gas are used, as in small burners, the gas should be fairly strong and of uniform quality, or the flames will not burn steadily. To anyone accustomed to the manufacture of ordinary lighting gas, these remarks may, perhaps, seem too elementary; but it should be remembered that generator gas is usually required in considerable quantity, and that, to avoid large gasholders, it should be made as quickly as it can be consumed. In one case I have had to provide plant to make gas at the rate of a million cubic feet per day, or about 90,000 cubic feet per working hour; and, without extensive appliance, the cooling and cleaning of so large a volume of gas is not so simple as it may at first sight appear.

The original invention dealt with the generator only; but I have since found it necessary to devise a complete set of gas plant to meet the requirements of practical work. In nearly all cases it is important that the apparatus should occupy as little room as possible, and the accompanying illustrations show the arrangement usually adopted. The steam boiler is small, and specially made with a superheating coil, so that dry steam enters the generator. The gas from the generator passes through water in the washer, and then through a scrubber containing coke moistened with water. The scrubber is placed inside the gasholder tank, so as to occupy as little space as possible. The rise and fall of the gasholder is made to regulate the supply of steam to the injector; so that to a certain extent the production of gas can be regulated automatically to suit a varying rate of consumption. In some special cases the gas is passed through oxide of iron, to remove all traces of sulphuretted hydrogen; but for general purposes chemical purification is not necessary. The whole is very compact; and a plant large enough to drive an engine of 50 indicated horse power occupies a ground space of only 9 ft. by 10 ft. I have always taken the view, and it has been confirmed by practice in many places that when the consumption of gas is regular there is no need for a large holder, provided the generator is well able to make gas at the maximum rate of consumption. In the case of engines, for instance, the gas plant is to the gas engine what the boiler is to the steam engine; and it is no more necessary to have a large reserve of gas than to have a large reserve of steam.

As regards the composition of the gas, it necessarily depends somewhat on the quality of the coal used, and on the fuel column being kept deep enough to insure a reduction of the carbonic acid. It has been an-

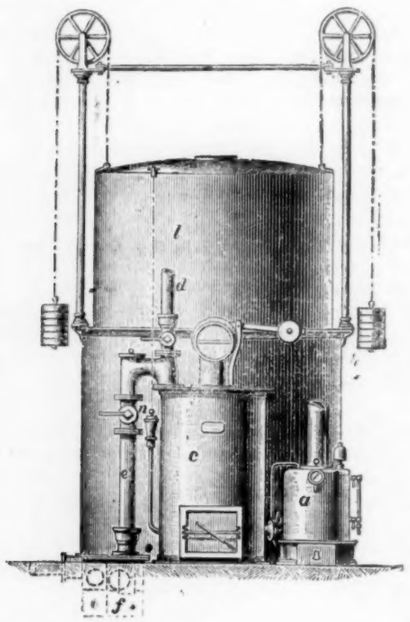
alyzed independently by Professor W. Foster and others; and, roundly speaking, the gas now made has the same composition as that made years ago. I then thought that possibly in a large generator, containing a great mass of fuel at a high temperature, the percentage of hydrogen might be increased and that of the carbonic acid reduced. Trials since made have, however, shown that the average composition is much the same, whether the gas be made at the rate of 1,000 cubic feet per hour in a small generator, or at the rate of 15,000 cubic feet per hour in a large one. In 1881 I stated that for gas engines it was then necessary to use 5 volumes of the generator gas for 1 volume of ordinary lighting gas, to develop the same power. Theoretically, the comparative explosive force of the two gases is as 3.8 : 1; and it was evident that so long as practice required 5 to 1, the weaker gas was not being used to the best advantage. Since then some important modifications have been made in the "Otto" gas engines; and I am glad to say that it is now necessary to use only 4 volumes of the generator gas. On this point, therefore, theory and practice are now fairly in accord. By calculation, the calorific power of 100 liters (3.53 cubic feet) of an average sample of the generator gas is 143,213 units of heat; while that of 100 liters of ordinary 16-candle power lighting gas is 569,264 units. Tests made with a calorimeter and in other ways confirm these figures approximately.

In 1881 only one engine of 3½-horse power had been worked with this gas; and this showed a consumption of 1.46 lbs. of coal converted into gas per indicated horse power per hour. Since then a large number of engines have been worked with it—one indicating over 80-horse power; and many independent tests have been made. Details of these will be found in a paper of mine contained in the Proceedings of the Institution of Civil Engineers for last year; and on the present occasion it will be sufficient to give a few instances only. For more than four years Messrs. Crossley Bros., the English makers of the "Otto" engines, have used this gas exclusively at their works for an average of about 150-horse power, and after a careful trial extending over 35 weeks they found that the fuel consumption averaged only 1.3 lbs. per indicated horse power per hour, including all waste and the coal burnt in the generator every night and during Sunday (112 hours per week), when the fire was alight although there was no work. At the time of this trial the construction of the generator rendered it necessary to draw the fire every two or three weeks to remove the clinkers adhering to the firebrick lining. Since then I have altered the generator, so that when the fire has once been lighted it need never be drawn. One of these generators has now been running continuously for upward of a year, and Messrs. Crossley estimate that this saves about 20 tons of coal per annum. It is also worthy of note that at these large works, owing to the use of gas, there is no chimney except for the blacksmith's shop. The returns sent me by eleven users of "Otto" engines working regularly in different places, and each averaging 35-horse power, also show an average fuel consumption of about 1.3 lbs. per indicated horse power per hour. Messrs. Ibotson, of the Colnbrook Paper Mills, were supplied with a single-cylinder "Otto" engine to indicate about 45-horse power with this gas, on the guaranteed condition that the engine and the gas plant could be worked continuously day and night, and that the fuel consumption should not exceed 1½ lbs. per indicated horse power per hour. A trial was made extending over two weeks—the engine being indicated day and night at frequent intervals; and the result showed that the guarantee was in all respects fulfilled.

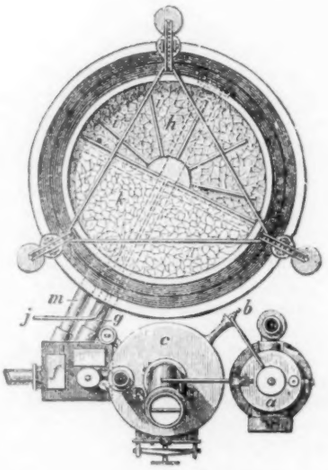
The "Otto" engine makers in Germany have made exhaustive trials with this gas in connection with several of their engines, and have fully confirmed the results obtained by Messrs. Crossley in this country. Professor K. Teichmann, of the Royal Technical School of Stuttgart, and Mr. F. Bocking, Chief Engineer of the Rhenish Society for examining steam boilers, made a joint test of a twin-cylinder "Otto" engine worked with this gas. The engine developed a brake power of about 52-horse power; and the total fuel consumption, including that used for the superheating boiler, was 1.6 lbs. per brake, or barely 1.3 lbs. per indicated horse power per hour. Professor Witz, of Lille, a well-known scientific authority on the gas engine, has tested two Delamare-Debouteville engines worked with this gas—one of 9-horse power and the other of 25 effective horse power. The first trial gave a consumption of 89 cubic feet of gas, equal to 1.33 lbs. of coal per brake horse power per hour. I have not exact particulars of the second trial, but I understand from the maker of the engine (Mr. Thomas Powell, of Rouen) that the result was even more favorable.

Seeing that all these results have been obtained under practical working conditions, the record is certainly satisfactory; and I am pleased to add that I have also many letters testifying to the ease with which the gas plant can be managed. This is an important point; for if the saving of fuel could only be effected in a complicated way, the apparatus could not be generally adopted. The total number of engines already made to work with this gas is 71; and the aggregate horse power is 2,390, or an average of nearly 34-horse power each.

I consider myself justified in saying that gas power is now fairly launched in competition with steam power, and, to my mind, there are reasonable grounds for supposing that eventually the former will, to a great extent, supersede the latter. In this view I am confirmed by the late Professor Fleeming Jenkin, who, in his lecture at the Institution of Civil Engineers on "Gas and Caloric Engines," remarked: "Since theory shows that it is possible to increase the efficiency of the actual gas engine two or even threefold, then the conclusion seems irresistible that gas engines will ultimately supplant steam engines. The steam engine has been improved nearly as far as possible; but the internal combustion gas engine can, undoubtedly, be greatly improved, and must command a brilliant future." It has been proved that the absolute efficiency of the gas engine—that is, the ratio between the indicated horse power and the total quantity of heat generated by the fuel per minute—is already about double that of the best steam engine. As regards the mechanical efficiency—that is, the difference between the gross indicated power developed in the cylinder and the effective power given off on the brake—in the condensing steam engine it is taken at about 80 per cent., and in the non-



a—Steam producer and superheater.
b—Injector.
c—Gas generator.
d—Chimney and waste pipe.
e—Down pipe conveying gas to hydraulic box.
f—Hydraulic box.
g—Inlet pipe of gasholder.
h—Wet scrubber.
i i—Water spray pipe.
j—Water supply pipe.
k—Dry scrubber.
l—Gasholder.
m—Outlet pipe of gasholder.
n—Steam and air escape valve.



condensing engine at about 85 per cent. In the gas engine I showed, in my paper at the Institution of Civil Engineers, before referred to, that the average of several samples given was about 84 per cent. The Otto and other compression engines are of comparatively recent invention; and it is fair to assume that further improvements will yet be made, as the principles on which they should be based are now well understood. An important modification, for instance, has only recently been made in the Otto engine—the slide-valves being entirely dispensed with.

We have seen that the results already obtained with this generator gas are good; but I cannot help feeling that still better ones can and will be obtained when the engine is really designed to give the best effect with a gas of this kind. It is well known that in the Otto engines each new charge of gas is diluted with a portion of the products of combustion from the previous charge; and, for reasons I need not discuss, this answers very well with ordinary lighting gas. But as generator gas such as mine has only about one-fourth the explosive power of the other gas, it is a disadvantage to dilute it with products of combustion. Sooner or later this point will, no doubt, receive due attention, especially as the use of gas engines of high power must depend on their being worked with cheap gas. Looking to the probable extension of gas power, it is, in fact, most important that the best possible engine should be made for the fuel gas.

For gas engines as now made it is important that the generator gas should be as clean and free from sulphur compounds and ammonia as ordinary lighting gas. With this in view, the best fuel to use is anthracite, as it does not yield tar or other condensable products, which foul the pipes and valves. It is also suitable because it does not cake and because it makes a dense fire free from holes. Good qualities of anthracite yield but a small percentage of clinker and of sulphur compounds, and no ammonia. With some special precautions ordinary gas coke can be used. The quality of gas coke varies, however, very much in different localities; and this is doubtless due, in some measure to the different kinds of coal from which the coke is made, but also to the varying heats to which it is subjected in the retorts of different gas works. Some coke yields very large quantities of clinker, and is quite unfit for use in such an apparatus as mine. Other samples yield less clinker; but owing to the comparatively low temperature to which they have been subjected in the retorts, they retain hydrocarbonaceous bodies, which vaporize in the generator, and are afterwards troublesome to remove from the gas. As before mentioned, these difficulties are not met with when the hot generator gas can be taken direct to a furnace; but when it is necessary to cool and clean the gas (as for engine work) special precautions must be taken.

Several trials have shown that when the gas apparatus is worked with anthracite the actual fuel consumption is about 13 lbs. per 1,000 cubic feet, including that used for producing the steam required; but to cover all sources of waste, as well as inferiority of quality, I usually allow 15 pounds per thousand cubic feet passed into the holder under ordinary conditions of temperature and pressure. On this basis the yield of gas is a little over 149,000 cubic feet, or allowing for the presence of 50 per cent. of nitrogen and carbonic acid, say, 74,500 cubic feet of combustible gas per ton of fuel consumed.

To determine the working cost of a gas engine driven with this generator gas compared with a steam engine and boiler, the more simple and direct way is to take in each case the weight of fuel used per horse power per hour, as it is no more necessary to determine the volume of gas consumed than it is to know the volume of steam used. We have already seen that with this gas the fuel consumption of several Otto engines doing practical work in different places averages only 1¼ pounds per indicated horse power per hour. The wages of the attendant, the cost of repairs, and the other working expenses are about the same as with a steam engine of equal power. The great difference is in the consumption of fuel; and, to make an exact comparison, I have taken the returns last published by the Manchester Steam Users' Association for all engines indicating under 100-horse power for which the net fuel consumption is given. The details of these returns will be found in Appendix II. of my paper read before the Institution of Civil Engineers; and from these it appears that the average fuel consumption is 7 pounds per indicated horse power per hour. If, however, an average be taken of five engines, each indicating 20-horse power, the fuel consumption will be over 11 pounds per indicated horse power per hour. It is instructive, too, to note what Sir Frederick Bramwell said on the fuel consumption of steam engines, in his address (January, 1885) as President of the Institution of Civil Engineers. He said: "In an investigation instituted last year by the Corporation of Birmingham, when considering whether they should approve of a proposal to lay down power distributing mains throughout their streets, it was found on indicating some six non-condensing steam engines taken indiscriminately from among users of power, and ranging from 5 up to 30 nominal horse power, that the consumption in one instance was as high as 27.5 pounds, while it never fell below 9.6 pounds; and the average of the whole was as much as 18.1 pounds per indicated horse power per hour."

It is quite true that in competitive trials at the Royal Agricultural Society's shows the fuel consumption of the best portable engines, working under the most favorable conditions for a short time, is slightly below 2 pounds per indicated horse power per hour; but this result can only be obtained by the most careful "nursing" of the fire by highly-paid skilled attendants, who salt the fire—so to speak—with a slight sprinkling of coal at very frequent intervals. In any case, we may safely say that, with gas power, the fuel consumption, under ordinary working conditions, is at least 50 per cent. less than with non-condensing steam engines of equal power. With gas there is the further advantage that it can be conveyed to any part of the works without appreciable condensation; that separate engines can be used for different lines of shafting, and that any department working overtime can have its engine supplied with gas from a single generator. With steam, however, there is much condensation if it is carried far, and much loss of fuel if a large boiler has to be fired to keep a small amount of shafting at work.

I have so far confined my remarks chiefly to the application of improved generator gas to motive power; and there is no doubt that the recent departure in this branch of mechanical science is one of great importance. I am, however, glad to add that a considerable advance has also been made in the use of this gas for heating of various kinds. At the Gloucester County Asylum it has been in daily use for a variety of purposes for about five years. All the kitchen work for the staff and inmates is done with it, and there is no ordinary fire in the kitchen. About 300 quartern loaves are baked with the gas every day, at a cost of about 1s. only for fuel. The gas is also employed for two 12-horse power (nominal) Otto engines which pump water and drive a dynamo for electric lighting. The average cost of the gas is about 2d. per 1,000 cubic feet, including wages, repairs and all incidental expenses, or about 8d. for the equivalent of 1,000 cubic feet of ordinary lighting gas. The anthracite costs about 13s. per ton. This gas is used on a large scale at the cocoa works of Messrs. Van Houten & Son, of Messrs. Chadbury Bros., and of Messrs. Russ-Suchard & Co. Careful trials at the first-named works showed that the cost was under 1¾d. per 1,000 cubic feet, or only 6½d. for the equivalent of 1,000 cubic feet of the town lighting gas, with which comparative tests were made. The anthracite costs 16s. per ton.

[The author gave the names of other firms who use the gas for industrial purposes.]

This gas is also used for melting type metal, for heating hat-forms, and for other work in a hat manufactory. It has also been adopted for glass blowing in an electric lamp factory, and for many other industrial purposes. I have, however, mentioned enough to show that gas of this kind can be and has been produced and applied successfully; and there is every reason to believe that its use will extend, especially as the gas making apparatus is easy to work. I am not at liberty to state the annual saving effected by several firms who use the gas, but it is very considerable. The cost of the gas somewhat depends on that of the fuel, and on the scale of working; but, speaking generally, the equivalent of 1,000 cubic feet of ordinary lighting gas costs from 6d. to 1s. Compared with solid fuel, gas has certainly many advantages. It is under complete control; the heat derived from it can be kept constant or varied at will; it is comparatively easy to insure complete combustion with but little chimney draught; it is more economical; and there is an entire absence of smoke. When solid fuel is used it is necessary to introduce more than twice the quantity of air theoretically required for combustion, in order to drive away the products of combustion, and to insure a sufficiency of oxygen being brought into contact with the surfaces of the fuel. This supply of air can only be drawn in by a strong chimney draught or other artificial means; and this causes a very rapid withdrawal of heat from the fire. Further than this, there is invariably some escape of smoke and partially burnt carbon in the form of carbonic oxide.

It is admitted that there is a demand for fuel gas; but for many purposes the ordinary lighting gas is too expensive, and the mere fact that it is made for lighting renders it so expensive. The percentage of illuminating constituents in coal gas is, indeed, very small; 20-candle power gas containing about 6½ per cent., and 16-candle power gas, as in London, containing only about 4 per cent. The remaining 93½ per cent. or 96 per cent is composed of non-luminous heating gases; and the addition of the small proportion of illuminants adds greatly to the trouble and cost of producing the gas, and any great reduction of its present cost is improbable. It is, therefore, rational to suppose that for fuel purposes the lighting constituents should be dispensed with.

Assuming that we have a good and cheap fuel gas, there remains the question of how to apply it advantageously to whatever has to be heated; and here, I regret to say, difficulties often present themselves. It is one thing to have a combustible gas, but quite another to find suitable apparatus to be heated with it. Take, for instance, the case of a circulating boiler for heating a building. There is not one suitable for gas. There are a very few quite ingenious little boilers for heating a small quantity of water; but as it would be too costly to heat a large one with town gas, there has hitherto been no inducement for boiler makers to trouble about a large size. In fact, the pioneer of gaseous fuel not only has to provide the gas, but in most cases he has also to devise the means of using it for the different purposes required. I have often been asked if generator or water gas can be used economically for heating ordinary steam boilers; and I have always been obliged to answer in the negative. I have seen examples of nearly all the water gas plants used in the United States and elsewhere, and I am aware that several attempts have been made to heat boilers with gas of this kind, but, so far as my knowledge goes, none of them have been successful from an economical point of view. In the first place, if the flames come in contact with the comparatively cool surface of the boiler there is such a rapid withdrawal of heat that some of the gas does not attain the temperature necessary for its combustion. In the next place, there is no overlooking the fact that there must be a considerable loss of heat when the incandescent mass of fuel is enclosed in a gas generator, away from the boiler, instead of being on a grate within or immediately under the boiler. I venture to think that the true solution of this important question is to be found in the production of gas within the boiler itself, and not in a separate apparatus. The mass of incandescent fuel would then assist, by conduction and radiation, in heating the boiler.

Reviewing the subject generally, I think it will be admitted that if the progress made has not been rapid, it has at least been sure; and judging by experience gained in several countries, I find that more attention is given to gaseous fuel every year. It is a subject, too, that is now much better understood technically than it was only a few years ago; and my belief is that every year will see gas more largely used. Speaking more particularly of my own contribution to the subject, it is only right that I should acknowledge my indebtedness for the encouragement I met with when I read my first paper on the subject in 1881. It has often occurred to me since that my own experience in this respect may be taken as a fair illustration of one of the practical advantages of the British Association meetings to a beginner, whose success must depend to a great extent on the help he derives from useful criticism and advice.

The Deptford Electric Lighting Station.

The projected central electric lighting station for London, under the supervision of M. Ferranti, is thus described in a recent issue of *Engineering*:

London is within a measurable distance of having an electric lighting station which will compare in size and in lighting power with one of its great gas works. The new establishment which is being built at Deptford by the London Electric Supply Corporation is conceived on a scale far beyond anything ever yet attempted in Europe or America, and is being executed with a solidity and completeness perfectly new to electrical undertakings. A survey of its unfinished buildings impresses the spectator with the idea that the period of experiment and tentative advance has passed away, so far as the Supply Corporation is concerned, and that the production of electricity has entered into the condition of a staple industry of which every phase is perfectly well understood, and in which the profits will be in proportion to the judicious expenditure of capital, and the reduction of working expenses.

One would imagine from the large sums which are being laid out, and from the confidence of the promoters, that the plant to be erected was only an improved and somewhat enlarged copy of some existing plant, just as the engines of each new Atlantic liner are one step in advance of those of the previous boat. Such a supposition would be a complete error. The new electrical machinery is so enormous as compared with anything in existence that it may be deemed a perfectly novel creation, a monument to the confidence reposed by the directors in their engineer, Mr. S. Z. de Ferranti.

Each of the main dynamos will be capable of absorbing more than 10,000 horse power, and of feeding 200,000 incandescence lamps of 10 candle power each. Two such dynamos are to be put down at once, and two more are looked forward to in the future, when the four will be able to feed the enormous number of 800,000 lamps. A pair of so-called small engines, giving 3,000 electrical horse power, are now ready for erection, and will drive two dynamos which will supply the current for the present, and eventually will be used for the day service. Buildings are nearly erected to contain all this machinery, with the boilers, condensers, pumps, and other accessories, while the plans provide for a future extension equal to or greater than the present undertaking.

The site of the works has been fixed at Deptford, to enable them to be on the banks of the river, and also because the Southeastern Railway offers a very convenient route by which the mains may be led to the City and to the West End, and in fact all over London, by connections with the Brighton, Chatham, and District lines. The distance of Deptford from the parts of the metropolis where the electric light may be expected to be most freely used—from the theaters, clubs, mansions, and fashionable shops—becomes of no moment when we learn that the current is to have an electromotive force of 10,000 volts, and that the loss in transmission will be only 3 per cent. It is not proposed to carry this enormous potential into the general distribution network. At various points transformers will be placed to reduce it to 2,400 volts, the standard pressure of the Grosvenor Gallery system, to which the new plant will be connected. Again, in each consumer's premises another transformer will reduce the voltage to 100 or 50, or whatever may be required. Thus there will be two transformations dealing with many thousands of horse power.

The whirligig of time has not been long in bringing Messrs. Gaulard and Gibbs their revenge (in an abstract sense) over the electricians who scoffed at their secondary generators at the Aquarium, when scarcely a scientific journal, except ourselves, would treat their invention in a serious spirit.

Of the dynamos by which this immense amount of electric energy is to be generated, we can say but little at the present, as Mr. Ferranti has not yet got all his patents complete. The two smaller ones are to be driven by 40 cotton ropes, each 5 in. in circumference. The larger ones are to be driven direct, each armature forming the flywheel of two pairs of inverted tandem compound engines, which supply the power. Each engine will have cylinders 44 in. and 88 in. in diameter respectively, with a stroke of 6 ft. 6 in., and will work on to a crank at one end of the shaft on which the armature is built. This shaft will be 36 in. in diameter in the body, and 28 in. in the bearings, and will run at 60 revolutions. The armature itself will be 45 ft. in diameter, and the height of the engines from the ground will be 46 ft.

It is not proposed to erect these engines completely at present. One pair of cylinders with their rods and fittings will be left off until the demands of consumers require the additional power. For the meantime each of the two large dynamos will work only at half power, and will be driven from one side only. All the engines are being built by Messrs. Hick, Hargreaves & Co., of Bolton. The steam is to be supplied entirely from Babcock and Wilcox boilers; and is to be used at a pressure of 200 pounds on the square inch. Boilers equal to 24,000-horse power are provided for in the present arrangements. The building in which they are to be placed measures 195 ft. by 70 ft., and is arranged in four stories. At the bottom come the flues by which the gases are conducted to the smokestacks at each end. There are also provided channels for feed and steam pipes, for pipes for compressed air for urging the fires if a sudden call is made for great additional power, and for many other purposes. The next or ground floor contains boilers, and over these is another floor of boilers, the upper story being a coal store of a capacity of 4,000 tons. The boilers are divided into groups of six, and each group will have its own flue, the smokestacks, which measure 24 ft. by 18 ft., being separated into four parts by division walls. Green's economizers are placed at the bases of the chimneys, and the hot gases can be passed through them or not as desired.

The premises occupy a site of four acres on the bank of the Thames. On the wharf stands a 50-ton crane for unloading the machinery, and a substantial railroad runs from the crane right through the ground. The building measures 210 ft. by 195 ft., and is nearly 100 ft. high to the ridges. It is divided into a boiler house 195 ft. by 70 ft., and two engine houses, each 195 ft. long, 66 ft. wide, and 85 ft. high. In each engine house there is a traveling crane, one being capable of lifting 25 tons, and the other 50 tons. The present building by no means exhausts the ground space. It can be extended both ways—towards the river to accommodate additional boilers, and in the opposite direction for the engines. The enormous total of 120,000-horse power can be provided, if necessary, without crowding.

From the building the current will be carried in mains of peculiar construction. These will each consist of two concentric copper tubes, the inner one being $\frac{1}{10}$-in. in diameter and $\frac{7}{10}$-in. bore, and the outer $2\frac{1}{10}$-in. in diameter, and the same sectional area as the inner. The space between the two will be filled with dielectric, and the outer tube will be joined to

earth at frequent intervals. This conductor will be constructed in 20-ft. lengths, and will be put together with a special joint with the same readiness that water pipes are erected. It promises complete immunity from accident in spite of the fact that the current will be able to spark through ⅛-in. of air. The outer envelope will always be at zero potential, and even if it be cut or broken the probability is that the two conductors will become short-circuited, and will cause the safety fuze at the engine house to be burned down.

It is impossible to hide from one's self the fact that this undertaking of the Supply Corporation represents an immediate step in advance of anything yet attempted, and that it carries with it many risks and chances of failure. But, at the same time, no one has so much experience in this class of work as they—how much experience they have no one knows but themselves, for they have been most reticent in all which regards their Grosvenor station. Already they have 33,000 lamps and 80 miles of mains in action under conditions which are far from being as favorable as those which they are now creating, and we may be certain that this network has not been supplied without the solution of many difficult problems. The past renders them sanguine for the future. They certainly deserve success, and should it come, the lion's share of the honor will be due to Mr. Ferranti, who has been engineer, electrician and architect to the whole enterprise.

The Galloway Boiler.

From the *Proceedings* of the Engineers Club, of Philadelphia, Pa., we take the following description (communicated by Mr. W. F. Sellers, C.E.) of the Galloway boiler:

This boiler, which has been in use in England for upwards of 30 years, was not brought prominently before American engineers until the occasion of the Centennial Exhibition of 1876. The three boilers exhibited and tested at this Exhibition were constructed of steel, and consisted of a shell 7 ft. in diameter and 28 ft. long. They were internally fired, there being two grates located side by side in cylindrical flues at the front of the boiler. These fire boxes were 33 in. in diameter and 7½ ft. long. Beyond the grates the flues joined in one elliptical flue extending to the rear of the boiler and crossed by 30 vertical conical water tubes known as the "Galloway tubes."

The heated gases from the furnaces pass around the conical tubes and through the elliptical flue to the rear of the boiler, return to the front along the sides of the shell below the water line, pass again to the rear, under the center, and escape to the uptake.

The construction has been greatly changed since the boiler was introduced here, but even in that form it was regarded in England as the most economical and efficient steam generator then made. In this original construction the conical water pipes were set vertical in three straight lines throughout the length of the eliptical flue. This obviously caused the tubes to be of different lengths, and to have their flanges set to correspond to the curve of the ellipse in which they were placed. This difference of length and angle of flange was a serious difficulty to their manufacture in quantity.

The first marked improvement in construction consisted in forming the top and bottom of this back flue in parallel curved lines, struck from a central line below this flue, and arranging the conical tubes radial to this central line.

The advantages of this construction consisted in allowing the conical tubes to be made of uniform length with parallel flanges, and consequently interchangeable. This change also allowed a greater number of the same sized tubes to be inserted, which increased the heating without affecting the outside dimensions of the boiler; the new shape of the internal flue also gave greater facilities for cleaning and examining the lower part of the boiler than in the old plan with the flue elliptical.

These improvements were patented in the United States, and the Edge Moor Iron Company became sole licensee and manufacturer of the boiler in this form.

Since taking up its manufacture several important improvements have been made that have further increased its economy and capacity.

The boiler, as now constructed, consists as before of a plain cylindrical shell, within which are placed two cylindrical furnaces, which unite into one back flue of an irregular, oval form; the top and bottom of this flue are curves struck from a common axis located below the flue. Its sides are semi-circular, but these sides are now formed with deep corrugations that assist in staying and strengthening the flue, promoting more rapid circulation of the water and better baffling of outgoing gases.

In this flue are placed the conical water tubes, each 10½ in. in diameter at the top, and 5½ in. in diameter at the bottom; they are set radial to the same axis used for the top and bottom plates of the oval flue, and make it impossible for it to collapse; they are also arranged to intercept and break up the flame and heated gases in their passage from the furnaces, and in this are ably assisted by the corrugations in the side sheets, which cause the gases to impinge against the tubes, and in addition provide for the necessary expansion and contraction, and by increasing the water space, enable this flue to be widened to a dimension equal to that of the two furnaces.

Another improvement in construction consists in forming the top, bottom, and sides of the internal flue of one sheet each, thus avoiding all intermediate circumferential seams, allowing the rows of tubes to come closer together, and increasing the number of tubes and heating surface without increasing the length of the boiler. The use of corrugated side sheets to this flue, replacing the bulged pocket, also increases the heating surface, promotes more rapid circulation, and stays more effectively this portion of the boiler.

As originally set, the heated gases passed from the fire-boxes through the central flue to the back of the boiler, thence along the sides to the front, where they passed to the rear and stack under the center of the shell. The boiler was supported throughout its length on two rows of wedge-shaped bricks; these, with the side walls of the setting (which were built to the side of the boiler at the water line), form the side flues; the boiler shell makes one side of this flue, and is exposed to the full action of the heat, as the products of combustion pass from the back to the front of the boiler, the wedge-shaped brick and supporting walls from the central flue leading under the shell to the uptake. The front of the boiler extended beyond the front wall of the setting, and was held rigidly by the brickwork; the back of the boiler setting was arched in below the water-line connecting the center with the side flues. This method of setting did not provide for expansion and contraction, and sometimes opened joints in the brickwork and allowed a portion of the gases to make a short cut to the chimney without passing the three lengths of the boiler, besides causing unnecessary strains on the shell itself.

The latest design in setting has reduced the amount of brickwork in contact with the shell, presenting a larger amount of heating surface to the out-going gases. The boiler is supported in a brick chamber, and is entirely free from the brickwork except at the front, where it is walled in and supported by a brick pier, affording bearing for the lower third of the shell. The rear of the boiler rests on a cast iron rocker, behind which a firebrick pier is built, that almost touches the underside of the shell; this pier acts as a baffler, and prevents the direct heat currents from acting on the rocker, and in case of accident to the rocker would support the boiler and prevent it from going down.

The front wall of the setting, above the third occupied by the brick pier, recedes one-half inch from the shell. In the covering arch of the boiler chamber similar clearance is allowed around the fittings, that the boiler may expand and contract without touching the brickwork. These spaces are filled with asbestos fiber, mineral wool, or other incombustible substance which will prevent air from being drawn into the boiler chamber.

The arched covering of the boiler at the water line is stepped out within 1 inch of the shell; above this line it recedes to about 3 inches, and forms an arched space over the top of the boiler. This space fills with the hot gases of combustion, which prevents radiation of heat from the top of the boiler, and insures slightly superheated steam; but from the method of construction of this arched space there is scarcely any circulation to the hot gases, so that danger from overheating of the shell plates above the water-line is avoided.

In this setting the boiler is held rigidly only at one end, and can expand and contract at will without imparting any strain either to the brick or to its own material. The hot gases, after passing from the fire-boxes through the central flue, circulate under and around the water heating portion of the boiler nearly its entire length before they are drawn off at the damper under the front of the boiler. In the old style of setting the gases of combustion made three horizontal passes of the boiler, from the furnaces to the uptake. The temperature of the waste products at the chimney was but little above the temperature of the steam in the boiler. This indicated great economy in the use of the fuel, but the long flues and sharp turns necessitated the use of great draught power to develop the full capacity of the boiler, and high chimneys meant a larger investment in the steam plant. In the new setting the gases of combustion make but two passes (the length of the boiler) from the furnaces to the uptake. While they travel a short distance in contact with the boiler, they move with much less velocity, because the gases, instead of being confined in small flues at the sides and under the boiler, are discharged directly from the central flue into a large brick chamber, from which they are taken to the chimney with much less friction—which means less draught power, a lower chimney, and less

capital invested for the same boiler capacity. As to the economy of the setting, the temperatures of the gases at the uptake are about the same as with the first method described; this is due to there being more boiler surface exposed to the action of the gases, and a reduced velocity or a longer period of contact, which balances the shorter distance traveled.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Nov. 10, 1888.

The Guide-Framing of Gasholders.—Another Reduction.—A Threatened Strike.—Gas from Tar.

Another chapter in the discussion that has lately occupied so much attention amongst gas engineers, as to the possibility of dispensing, either wholly or in part, with the external framing of gasholders, has been contributed by Mr. George Livesey, in the form of a paper read day before yesterday at a meeting of the Southern District Association of Gas Managers. He commences with a description of the circumstances which led to an experiment at the Rotherhithe gas works, where a double-lift holder, 150 feet diameter and 50 feet high, has had a third lift added, enabling it to rise to the height of 75 feet, without carrying the framework any higher; so that when full the third lift rises entirely above the guide-framing. This idea was originated by him in 1881, but not carried out till 1886. He considered that the credit for first suggesting the possibility of working gasholders without external framing was due to Mr. W. H. Y. Webber. After Mr. Webber had thrown out the idea, it occurred to Mr. Livesey that if some means for maintaining the bottom curb perfectly level, whilst free to rise or fall, could be discovered, a great step would be made in the direction indicated. This was set forth in the course of a letter addressed to the *Journal of Gas Lighting* about 18 months ago, as follows: "If some practical means could be devised whereby all the bottom rollers might be made to rise or fall equally, and none of them could rise above or fall below the others, the holder would then to all intents and purposes have a solid foundation, and no columns or guide framing of any kind would be necessary." Mr. Gadd's ingenious and novel invention of spiral guides seemed to have solved the problem. By means of this invention it was possible, for the first time, to hold the bottom of the holder in a horizontal position. But the holder would not be simply standing on a solid foundation. It would be supported from the crown, with the sides suspended therefrom, and the whole held firmly level by the rollers acting on the spiral guides. He failed to see how this plan diminished the distorting and buckling strains on the side sheets of an unsupported holder, and it was an important question whether, having regard to the want of strength in the side sheets to resist these strains, it was practicable or advisable to dispense entirely with guide-framing for telescopic holders. Assuming that such was practicable, the next thing was to find the simplest plan of effecting that object. They all knew Mr. Gadd's plan; and he (the reader) now introduced an upright channel guide to effect the same purpose. This was either made in channel form with a single tangential roller, or solid with two tangential rollers. The special feature of the guide consisted in alternate projections and hollows on the sides, the projections on one side being opposite to the hollows on the other, thus compelling the roller (and the holder with it) to follow a zig-zag course in traveling up and down, instead of a perpendicular line. By this means he secured the advantages peculiar to Mr. Gadd's invention in another way. The outside width of the zig-zag path followed by the rollers was very small, not deviating more than a few inches from a perpendicular line.

In my letter for last November I referred to the reduction of price offered by the Gas Light and Coke Company, of London, to their consumers. On that occasion it was reduced from 72 to 66 cents in the case of common (16 candle) gas, and from 90 to 82 cents in the case of cannel (22 candle) gas. The Company supply these two qualities in different parts of their district. The portion supplied with the superior gas is comparatively small, and comprises a district originally supplied by a Company which has since been amalgamated with and merged in the Gas Light and Coke Company. The object of that Company was to supply a high-quality gas, and the obligation to do so remains in force and has been accepted by their successors. I have now to record a similar reduction. After the 1st of January the price of common gas will be 60 cents, and for cannel gas 74 cents per 1,000 cubic feet. During the last half year, as remarked at the time that the accounts were published, a good balance of profit remained after paying maximum dividends, but not sufficient to warrant the expectation of a further and such a handsome reduction of price at present; and under such circumstances the next balance sheet, setting forth the state of affairs for the current half year ending on December 31 next, will be looked for with peculiar interest. Either the Company have been able to reduce their expenditure, as was the case last year, or else they have experienced an increase of revenue. I remarked a month or two since that the result of the reduction in price was not indicated in the form of increased consumption of gas, and possibly it is now found, with the approach of the winter season, that matters are moving in this direction. The finances are no doubt assisted by the improved value of tar products and of coke. It is only fair to the management of the Company to record the fact that the reduction is not the result of outside pressure. Although there was no marked increase, there has been no falling off in their business. Both the sale of gas and the profits earned were well maintained. So there is no ground for believing that the reduction is due either to the competition of oil or of electricity. Nor have any representations on the subject been made to them on behalf of the consumers. The reduction is simply a concession offered to the consumers with a view of securing their approbation and increased patronage, and the wisdom of such a policy is beyond question. The only adverse consideration is whether such a marked reduction, to the extent of 12 cents, within only two years, is not apt to raise a suspicion in some quarters as to the accuracy of the published accounts, and a belief that figures can be made to prove anything. I remember the case of a provincial gas company in the coal famine of 1873. Having a large reserve fund, they prepared to spend the whole of it rather than increase the price of gas, notwithstanding the fact that coals were more than doubled in price. But this was not accepted as an act of generosity, by the consumers; on the contrary it gave rise to an impression that the price of gas must have been maintained at an unduly high rate for some years previous.

A "threatened strike" amongst coal miners is quite a feature at this season of the year. It does duty, in company with anecdotes of the gigantic gooseberry character, as a means of filling the columns of the newspapers. This time we are told of a firm determination on the part of the men throughout the principal colliery districts to stand out for a 10 per cent. increase of wages, and also that the owners of the collieries cannot afford to pay it. But it appears that the men have been successful. It is a general practice amongst dealers and coal merchants to lay in a large stock of coal during the months of August and September, and having done this the "threatened coal strike" scare cannot be at all objectionable to them, as it is always attended with a prompt and more or less successful attempt to put up the price of coal. No doubt many persons, alarmed by the unpleasant prospect of scarce and dear coal during the inclement, or in the case of gas engineers, during the busy season of the year, hasten to replenish their stocks to the utmost, even at a slight sacrifice in price. My object in drawing attention to this fact is to point out the necessity for gas companies not "to make hay," but to gather in coal, while the sun shines. Let them follow the examples of the merchants and lay in such a stock during the months of August and September as will enable them to pass over the "threatened strike paragraph" and the leading article setting forth the certain prospect of dear coal with perfect equanimity. If care is taken to secure freshly wrought coal, and to stack it under cover, the improved results obtainable as compared with a coal that has been allowed to get soaked with rain or snow are such as will yield a handsome interest on the money invested in the coal, and on the cost of stacking and trimming. Besides this there is the fact which has been pointed out repeatedly that colliery owners would be glad to accept a lower price on a coal contract if the coal was taken in regular quantities throughout the year, summer and winter alike, instead of in quantities proportioned to the consumption.

Whenever coal gets dear or tar gets cheap there are sure to be some schemes hatched for turning the tar to account, and the fact that various authorities have shown from time to time that the quantity of useful illuminating gas contained in coal tar is quite limited, does not deter inventors from making endeavors to increase the yield and illuminating value of the gas obtained from coal by gasifying, either entirely or to a partial extent, the tar obtained in the usual process of distillation. The latest speculator in this already overtrodden field, disfigured with the ashes of many a futile scheme and financial bubble, is the Dinsmore Gas Company, limited, an undertaking promoted in Lancashire for the purpose of working the inventions of a Mr. Dinsmore. The principle upon which Mr. Dinsmore's idea is based may be illustrated by supposing that each ascension pipe instead of ascending perpendicularly is bent over at right angles so as to pass through the setting above the retort to the back end and there joined to a U-piece, so as to return back through the setting to the front and then returned through the setting again. The exact number of heated passages is varied from one upwards according to the nature of the material under distillation. There is a continuous fall

towards the retort throughout, and arrangements are made for the effective cooling of each U-piece, either by a water jacket or otherwise. The gas and tarry vapor is thus subjected, as it passes from the retort, to alternate heating and cooling, repeated two or three times. The richer the gas produced the greater the extent of treatment. The effect of this, it is supposed, is that while the permanent gases are not influenced in any way by the cooling, the tarry vapors and heavy hydrocarbons are condensed in a liquid form and flow back into the heated part where they are again exposed to heat and decomposed into a permanent gas. No tar is produced, and the excess of carbon is deposited as soot. By means of this process it is claimed that a yield of 13,000 cubic feet per ton has been obtained from ordinary coal, and at the same time the quality has been improved to the extent of 50 per cent. or so. Thirteen thousand cubic feet of 24-candle gas in place of the ordinary 10,500 cubic feet of 16-candle gas is a vast improvement. The actual illuminating value obtained is nearly doubled. If the Dinsmore Company really find that this remarkable result can be attained under ordinary work-a-day conditions they should lose no time in advertising the process and inviting the attention of gas engineers thereto, as they may be assured that, in the absence of attendant drawbacks, there is a prosperous future before them.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. WM. BURKE, the electrician in charge of the electric station of the Decatur (Ills.) Gas Company's plant, has invented a new fire alarm system. The signal boxes are faced with glass which must be broken before an alarm can be sounded. When the system is to be availed of the signaller having shattered the glass, turns a lever and the message is conveyed by the electric current to the engine houses. At the receiving end the alarm is sounded distinctly five times, the last stroke being followed by the printing on a tape of the number of the station from which the alarm was originally despatched. The City Council of Decatur has determined to employ the system in connection with its fire department.

THE Directors of the Waltham (Mass.) Gas Light Company have reengaged Mr. Spaulding as Superintendent, Mr. Woodward also retaining his position of Asst. Superintendent.

A SUIT that has attracted much attention in the South was that of Hagan vs. the Standard Gas Machine Company, of Chattanooga, which case was recently decided in the Circuit Court for the district. The facts brought out by the evidence are the following. The Company was engaged in the manufacture of gas machines on the premises, Fourth and Market streets, Chattanooga, and occasionally carried quite a large stock of gasoline; it should also be said that the building occupied was a frame one. On June 9, 1887, while testing a finished machine, an explosion of gasoline occurred, and the shock thereof, together with the resultant fire, not only destroyed the Company's building but also the adjoining structure, in which R. W. Hagan carried on a trade in miscellaneous goods. In order to complete the narrative of loss it may be mentioned that a secondary gasoline explosion (when the flames reached the main body of that article in store) occurred, which caused the death of two firemen—Wm. Peake and Henry Iler. Hagan, after several attempts at compromise had failed, brought the suit above named, placing his damages at $1,800, and received a verdict for the full amount. It is now probable that the heirs of Peake and Iler will attempt to recover damages. In the meantime, however, these should bear in mind the fact that, under the laws of Tennessee, the stockholders of a company are only legally liable in such cases to the extent of the stock for which they have subscribed.

THE Messrs. Westinghouse, of Pittsburgh, Pa., are noted as what our Western folks would call "pushers" in the matter of securing business, and it has on more than one occasion been noted that their efforts in this direction are somewhat like those so successfully followed a few years ago by capitalists who dealt liberally in opposition gas charters. Whether or not the Westinghouse Company *per se* was at the bottom of the recent Binghamton (N. Y.) operation we know not; but the facts in the case are these. Some weeks ago a party of capitalists visited Binghamton and appealed to the Council for the right to set poles, string wires and supply "therefrom and thereby" incandescent electric light to the residents, the Binghamton Gas and Electric Light Company meanwhile having engaged in the electric lighting business only to the extent of furnishing arc lamps. They (the capitalists) divided their attention between the Council and the Gas Company, and finally agreed to withdraw, provided the local gas men would purchase and operate an incandescent "long-distance" system of the Westinghouse type. Mr. Anderson, of the Gas Company, finally completed the purchase, whereupon the capitalists vacated the field. We may now look for these or other capitalists of similar type to appear in localities which give promise of like results.

WE understand that the Cottage City (Mass.) gas works were recently shut down in order that contemplated extensions and improvements might be perfected. It was rather severe, however, on the Company's patrons that their light should be snuffed out even for a single night.

ABOUT 10 days ago a gang of workmen in the employ of the Equitable Gas Light Company, of this city, while engaged in making a trench through the rock formation in First avenue close to 37th street, encountered some pretty obstinate material. The foreman concluded that an extra charge of explosives would be necessary to secure the desired results, and the drill holes were loaded accordingly. The "blast" was a perfect success in respect to the cubic contents of material displaced; but as the latter included a large section of an 8-inch main of the Standard Gas Company, the net result may, when the damages are paid up, not be so profitable after all. One might expect such extravagant disregard of other people's property were the offending excavators in the employ of city-repairer-extraordinary Mr. Dick Cunningham, but that gas men should treat one another so is a trifle out of the common. The fractured main was working to its fullest capacity, and as the explosion which caused the rupture also fired—and luckily so—the escaping gas, the Eastsiders experienced the novelty of an infant natural gas well in action. The flame column is said to have risen to a height of 20 feet or more.

A HINT from Salt Lake City (Utah) is to the effect that the local gas company has purchased an additional plot of real estate. Is this purchase the forerunner of a great scheme of extension?

FORT MADISON (Iowa) is again in trouble with her gas supply. This time it is all on account of an organized labor strike. The force (consisting of one man) refused to work any longer, threw down his clinkering bar and gave up the keys. The Secretary manfully attempted to fill in the gap, but finally succumbed. Result, darkness—for the time at least.

ABOUT a fortnight ago an explosion occurred in the purifying room of the works of the Union Gas Company which supplies gas to some of the larger mills in the northern or Pontoosuc district of Pittsfield, Mass. A leaky box permitted an escape of gas, which eventually found its way into the retort house—the purifying room and generating room were separated by a simple partition—there to become ignited. The house, which was in charge of watchman Johnson, was supposed to be visited by the latter at least once every hour, and it is presumed that he failed to discover the leak through having converted what should have been hours of wakefulness into those of repose. The explosion, although of sufficient force to blow out the north end of the building, did not disrupt any of the connections, and the supply of gas to the mills was not interfered with. Loss, about $500. Under the conditions at Pittsfield, it is somewhat wonderful that such an accident as this was not reported before; and perhaps the Gas Commissioners of the State might find it within the lines of their duty to insist that hereafter the generating and purifying departments of this gas plant shall be properly divorced.

WE understand that the Westinghouse Company has purchased a controlling interest in the stock of the Waterhouse Electric and Manufacturing Company, of Hartford, Conn. This trade fills a "long-felt want" in the inventory of the property of the Westinghouse concern, in that it gives the latter control of an arc system which is at once meritorious and economical.

THE Sedalia (Mo.) City Council has advertised for bids for lighting the city, the contract to run for a term of 5 years. The electricians will make a bold effort to secure the award.

THE manufacturing plant of the Fort Wayne Jenney Electric Light Company was completely destroyed by fire on the afternoon of November 23d. Loss, about $200,000.

WHILE both parties were earnestly engaged in figuring out a majority for their respective candidates in old Virginia, it seems that at least two persons in Norfolk were undisturbed by the fluctuations in the canvass. These were Mr. Walter C. Darst, of Circleville, Ohio. and Miss Daisy Emma Bates, eldest daughter of Mr. T. A. Bates (the well-known Superintendent of the City Gas Light Company, of Norfolk, Va.), who were united in marriage on the afternoon of November 21. May the young couple ever be ranged on the negative side of the conundrum which seeks to determine that marriage is a failure. In passing, it might

be remarked that the groom is an Ohio editor, with every probability that ere long his name will be widely known beyond the limits of the Buckeye State.

ACCORDING to advices from St. Louis, we note that another legal victory has been scored by the Laclede Gas Light Company; this time in the Supreme Court. The case, which is entitled the "City of St. Louis vs. the Laclede Gas Light Company," was brought, at the instance of the city, on in the December term of a local court in 1881, and came up for trial, before Judge Lubke, November 2, 1883. The action was in ejectment, the city asserting that the Company held possession of a portion of certain real estate without legal claim thereto. The property in dispute embraced a portion of Howard levee and street, beginning at a point on the east side of First street, 273 feet north of Mullanphy street; north and along the east line of First street 58.63 feet, east and parallel with the north line of Mullanphy street to the river; south along the river to a point in a line running 273 feet north of and parallel with the north line of Mullanphy street, thence west with the latter to the place of beginning. Originally City Counsellor Bell asked that the city be given possession of this tract; that it be awarded $10,000 damages, and that the sum of $150 per month for rental and profits during tenancy of the Company be also decreed. Defendant set up in answer a flat denial of plaintiff's allegations, backed up in the further declaration that it and its grantors had held adverse possession of the property for something over 40 years. Judge Lubke decided in favor of defendant, and his opinion was affirmed *pro forma* by mutual agreement of counsel in Court of Appeals, Oct. 28, 1884. This agreement was made in order to hasten the trial to the Supreme Court. The appeal to the Court of last resort was taken about 4 years ago (Nov. 5, 1884), and the final decision quiets the title for all time. While there was little doubt at any time of the eventual success of the defendant, the cloud on the title having been dissipated of course pleases the proprietors. The value of the property now is high up in the tens of thousands.

THOSE looking for a good engine will do well to send to the Ball Engine Company, of Erie, Pa., for a copy of its catalogue before finally placing their orders. The Ball high speed automatic cut-off engine is a good motor, and to show that it is appreciated we append the following list of the Company's recent shipments:

Purchaser.	Number and Capacity.
California (San Francisco) Electric Light Co.	Two 80 horse.
Pittsburgh (Pa.) Traction Co	One 25 "
Xenia (O.) Electric Light Co	" 40 "
R. Webber, N. Y. City	" 80 "
Cascade Milling Co., Sioux Falls, Dak. Ter.	" 80 "
R. P. Francis, Hoboken, N. J.	" 80 "
Lynn (Mass.) Gas and Electric Light Co.	" 100 "
Danvers (Mass.) Electric Light Co.	" 60 "
John Wanamaker, Chester Hills, Pa	" 60 "
City Gas Light Co., Norfolk, Va	" 80 "
N. Pac. Ry. Co., Martin, W. T	" 60 "
Merced (Cal.) Electric Light Co	" 25 "
Woodward & Lothrop, Washington, D. C.	" 35 "
Edison Electric Light Co., Erie, Pa	Two 100 "
Aultman, Miller & Co., Akron, O.	One 50 "
Morgan Engineering Co., Alliance, O.	" 50 "
Cameron Bros., Petersburgh, Va.	" 60 "
Thomson-Houston Co., Brunswick, Ga	" 80 "
Webster Paper Mill, Erie, Pa.	Two 100 "
T. P. Conard, Phila., Pa	" 35 "
Street Railway Co., Washington, D. C.	One 100 "
Smith, Gray & Co., New York	" 100 "
Jenney Electric Co., Topeka, Kas	" 80 "
Austin (Tex.) Water, Light and Power Co.	Two 100 "
C. L. Robinson, Princeton, N. J	One 25 "
Fremont (O.) Electric Light Co	" 100 "
Territorial Penitentiary, Walla Walla, W. T	" 60 "
Toledo (O.) Electric Light Co	" 100 "
Snohomish (W. T.) Electric Light and Power Co.	" 35 "
Glasgow Co., Holyoke, Mass.	" 100 "
Excelsior Electric Light Co., N. Y	? 235 "

THE gas works at Tucson, Arizona Territory, are to be rebuilt on an enlarged scale.

ANOTHER suit is reported from St. Louis, and this has a decidedly novel basis. The St. Louis Illuminating (electric) Company alleges that A. Joyce, the contractor who erected and removed the gas piping and fixtures employed this year in the grand annual street illumination during Fair Week in St. Louis, while erecting gas fixtures at the intersection of Fourth street and Clark avenue wrongfully fastened a wire across two of its current carriers, causing a ground, the electric current passing off by way of the upright gas pipes. As a result, "the electric lights south of the ground were extinguished, much to the annoyance and discomfort of the Company's patrons," who, however, subsequently were pacified by means of a reduction made on the face of their bills. For contractor Joyce's trespass the Company asks damages in the sum of $400.

WE regret to have to say that Mr. W. B. Houston—recently re-elected Secy., Supt., and Engineer to the Rahway (N. J.) Gas Light Company—because of a return of the complaint which recently prostrated him, has resigned the dual position of Secretary and Superintendent, but still retains the berth of Engineer and his place on the Board of Directors as well. He will take a long vacation in the far West, and will probably winter in Phœnix, Arizona Territory. Apart from the nature of the cause which impels him to turn his face westward, we are sorry that he goes so far from the scenes of his former struggles and success. He is a persevering, bright, capable young man, and in addition to our firm belief that the change of climate will banish his physical ills, we further hope that Arizona may afford him a chance to re-engage in a business for which he is peculiarly well fitted.

IN the case of T. W. Richards vs. the Citizens Gas (natural) Company New Brighton, Pa.—a suit for damages arising from an explosion of gas whereby the plaintiff sustained severe personal injury—the jury awarded plaintiff the sum of $767.61. The success of Papa Richards has induced his son (it was in the latter's home that the father received his wounds, the house being also pretty badly wrecked) to institute a suit. Now; if the debris could only bring its splinters to the attention of a third faithful twelve!

THE new storage holders of the Omaha (Neb.) Gas Manufacturing Company are to be located in the plot known as Olsen's addition, the Council having granted President Murphy's prayer to have the land declared vacant.

THE following resolution, adopted a fortnight ago by the Troy (N. Y.) Common Council explains itself: "*Resolved*, That the resolutions suspending the privileges and permission granted to Charles McCarthy and others to manufacture and distribute non-illuminating gas in the city of Troy, passed May 19, 1887 are hereby rescinded, and consent is hereby granted to such corporation, formed by said McCarthy and others to lay conductors and mains for conducting gas for fuel, illuminating and other purposes, through the streets, lanes, alleys, squares and highways and public places in such city; subject, however, to all the terms and conditions and regulations set forth in an ordinance entitled, 'An ordinance* to regulate the use of illuminating and fuel gas in the city of Troy, for the better protection of life and property, and the manufacture and sale thereof, and to provide for the laying of mains or pipes thereof in the streets, alleys, highways, squares and avenues of the city.'" It will be noted that this ordinance permits the manufacture and sale of *illuminating* gas, whereas the suspended one provided for the supply of a fuel gas only.

A FORTNIGHT ago we intimated that the taxpaying voters of Lansingburg (N. Y.) were to have an election for the purpose of deciding whether a proposition submitted by the Thomson-Houston Company for the lighting of the village would be accepted. The conflicting interests managed to make a most lively canvass, which, in fact, in some respects resembled the general political election of Nov. 6. When the polls were closed it was found that 213 votes had been cast, of which 109 opposed the policy, while the remaining 104 favored it. This was pretty close work, and there is every probability that had the Thomson-Houston proposition been founded on the idea of an arc supply instead of one based on the incandescent plan, the verdict would have been reversed. The promoters of incandescent electric lighting may, at their show stations in the larger cities, give something like an adequate illuminating service; but in places off the show lines, and particularly where the plant is controlled and operated solely in the interest of local capital, the ordinary 16-candle incandescent lamp is a veritable parody of what a lighting service should be. To come back to Lansingburg, it may be noted that a correspondent in that village thus writes about the lighting election: "The next meeting [referring to the possibility of a subsequent lighting struggle] should be called with the express understanding that the contract will be let to the lowest bidder, and that all the lights must be of the powerful arc pat-

*See JOURNAL, June 16, 1887, p. 374.

tern. Incandescent lights are of no use." Possibly an inelegant but certainly an emphatic way of putting it.

A SUBSCRIBER in Nevada (Mo.) closes a recent letter to the proprietors of the JOURNAL in the following words: "Success to your JOURNAL. We think we get the value of a year's subscription out of each issue." Well, it is our intention to keep right on. In fact, we may move on a trifle faster in future; not, however, in respect to giving aid or comfort to anything or anyone that threatens to interfere with the continued supremacy of gas as the foremost artificial lighting agent of to-day and to-morrow. Our increase in pace will be shown later on.

WE regret to report the resignation of Mr. Jno. Roberts, formerly Superintendent of the Twenty-Sixth Ward station of the Philadelphia gas works, whose voluntary act thus severs a period covering over 30 years of efficient and honest duty in the service of the corporation.

THE bids submitted to the Council of New Haven (Conn.) for the public lighting of that place for a period of three years from January 1st are as follows: New Haven Gas Company: For gas furnished to each lamp, $19.75 per annum, with an annual allowance of $5.25 per lamp for repairs, painting and breakage. Gas is to be supplied to the public buildings at the rate of $1.50 per thousand cubic feet. The electric light Company wants 47 cents per night for each straight post arc lamp maintained, mast arm lights to be paid for at the rate of 50 cents each. Thomas Brennan agreed to maintain naphtha lamps for $22 each per annum, his bid being 75 cents per lamp under the offer made by the New York and New Jersey Globe Gas Light Company.

THE proprietor of the Ogdensburg (N. Y.) Gas Company is busily engaged in overseeing the construction of the handsome stone building (67 feet by 34 feet, and two stories high) intended to house the electric plant recently ordered. The stone for this structure, it may be said, is quarried on the premises.

A HINT in connection with that "fraternal gas war," which is now being waged in Macon, Ga., is to the effect that early on the morning of November 7th the gas of the Consumer's Gas Company gave out. The Macon *Telegraph*, in explaining the "giving out," says the failure was "owing to the unusual demands upon the works, and also the fact that the supply of oil promised two days ago by local dealers had not arrived. The management assures customers that the gas will be all right to-night, or otherwise, that notice will be given to-day." Brother Boardman ought to be able to preserve his temper under such conditions as these. In fact we think he might occasionally extend a helping hand to such a competitor as this one seems to be—that is, if there is any virtue in the practice of the policy that tends to help along a weak competitor, for fear that in the event of his collapse the weakling might be succeeded by a more lusty rival.

THE village of Waterloo (N. Y.) has, for about 18 months, been lighted by means of 50 half-power arcs, which were maintained on a moontable basis by the Thomson-Houston Company for the sum of $50 each per annum. The contractors do not seem to covet a renewal of the contract (it expired on the first inst), having given notice that hereafter they could not agree to perform the duty unless Trustees increased the contract rate to $65 per lamp per annum.

ANOTHER business center (Lockport) in the Empire State has taken alarm at the great increase in the cost of lighting its streets since the arc system has been employed. So marked has been the increase that Mayor Oliver felt impelled to issue a special message concerning it, and his remarks thereon are worth while reading. The Mayor shows that when gas was employed the annual expense was but $8,800, whereas the payments on account of electricity for this twelvemonth's lighting will exceed $16,000. The Mayor, however, in suggesting a remedy, does not advocate a return to gas, but discusses the probability of economies involved in the operation by the city of a municipal electric lighting station. This way out of the dilemma, of course, paves the projected road with the bitter and unflinching antagonism of many wealthy citizens of the city who have invested in electric light stock. Our informant says that politics (and of a pretty mean sort, too) may have inspired Mayor Oliver in this matter, and adds that in any event this burning question is likely to cause many heartburnings in the handsome Mountain Ridge City. We are not conversant with all the side issues in the Lockport instance, and of course are in the dark now as to what the outcome of the lighting squabble shall be; but on general principles, founded on a knowledge of what has been the result in other places where the municipalities have gone into similar ventures, we are inclined to the view that if Lockport accepts Mayor Oliver's suggestion she will simply have removed herself from the gridiron to find a resting place on the coals—and hot ones at that.

FROM the monthly report (October) of the patrolmen of Holyoke, Mass., it is shown that 52 electric lights in different sections of the city either failed to burn according to contract or had not been lighted at all during the period under review. At the beginning of the year the Company—which operates a plant of the Schuyler type—supplied the city with 92 arcs (2,000-candle power), 21 of which were in duty all night, the remainder being shut off at midnight, the nights of duty in month being—minimum 20, maximum 24. The short-hour service cost the city 37½ cents per night, the longer service being charged for at the rate of 50 cents. If the October deficiency occurred on a service no larger than that above noted, it will be seen that the service must have been very imperfect.

MR. KELLER'S coke crusher (it is also an admirable coal breaker, which fact those engaged in the manufacture of water gas might do well to make a note of) and Patent Drip Pump Boxes still find favor with the trade. For instance, since our last account of his shipments was published he has filled the following orders: Crushers were sent to the gas companies at Keokuk, Iowa; Logansport, Ind.; Muskegon and Bay City, Mich.; Birmingham, Conn.; Lawrence, Mass.; and to the following coal operators: Acme Facing Mill Co., Mt. Pleasant, Iowa; E. W. Hill, Nashville, Tenn.; Lehigh Coal and Iron Co., St. Paul, Minn.; Luther & Tyler, Chicago, Ill.; W. Wyatt, Eagle, W. Va.; and the West Fairmount and Marion Consolidated Gas Coal Co., Fairmount, W. Va. Drip Pump Boxes were taken by the gas companies at Ashtabula, O., and Ilion and Mohawk, N. Y. Keep it up, Brother Keller.

MENTIONING the above recalls the fact that the Citizens Natural Gas Company, of Columbus, Ind., which, of course, is the Post Office to which Supt. Keller's letters are sent, has just finished sinking a second well—their first venture was a complete failure—and on the strength of a very feeble flow of gas took the trouble and went to the expense of "shooting" it. The attempt did not improve the current, but it exasperated the "borers" to such an extent that they are now talking of piping-in gas from Indianapolis, a distance of 44 miles. There is, however, no field in Columbus for warranting such an expenditure, and we take it for granted that the Columbus Gas Light Company is not greatly concerned over the proposition.

A LETTER from Supt. Printz, of the Zanesville (O.) Gas Light Company shows that a sort of fatality attaches to a certain room in the Kirk House of that city, for several of the inmates assigned to it within the last year seem to be permeated with the idea that gas, in order to be extinguished, must be blown out. About a year ago the room "developed" this tendency in its occupants—it must be charged to the room (for lack of a better reason), for the other rooms in the house have not contributed similar leaves to the history of the hotel—at which time the first "blower out" came on the scene. The initial experimenter escaped with his life; but less fortunate was the second, who, in March last, managed to make his exit by what the Chicago reporters are pleased to term "the gas route." Case No. 3 in the fatal chamber of the Kirk House was reported a few days ago, the sufferer this time being a Miss Stroud, who was on her way to her home in Byesville. Arriving by a late train in Zanesville, and unable to take another train to her destination that night, she put up at the Kirk, was assigned to the room with a history, prepared herself for rest and calmly blew out the gas. At 5 o'clock of the following morning the smell of escaping gas was detected in the corridor, and an investigation luckily revealed Miss Stroud's predicament ere it was too late. Physicians were summoned, and their persistent efforts were finally rewarded with success. She had been exposed to the gas for 9 hours—between 8 P.M. and 5 A.M.—hence it is fortunate that her experience was had in Zanesville, Ohio, rather than, say, in some of our down-town New York hotels. The main inference that we wish to draw from the history of the Kirk house case, however, is in relation to the liability of newspaper reporters to charge suicide in such instances. Here we had all the usual details. A young woman of evident intelligence and refined appearance enters a room in a public hotel—at a late hour and unattended—goes at once to bed, and is subsequently found in an unconscious condition with the gas pouring out into the apartment from a fully turned on burner. Mr. Reporter rushes in, views the surroundings, asks a few "leading questions," and rushes off to inform the patrons of his paper that "all appearances point to intentional self-destruction." The original article about the discovery of Miss Stroud's perilous condition, as it appeared in the Zanesville paper for-

warded to us by Mr. Printz, while not stating in so many words that she had attempted suicide, nevertheless was colored in such a way as to suggest that idea to the reader's mind. On her recovery, however, she said that not being accustomed to the use of gas light, and being very tired, she blew out the gas without any thought of the consequences of such rashness. Of course, if Mr. Reporter would only follow his case up—newspapers rarely refer a second time to a case of asphyxiation, unless the victim dies—his study would frequently show him that his off-hand verdict was an unfortunate fallacy; and thus he might do partial reparation to the character of a sufferer, ignorant though the latter might be, that had been stained by the scribe's desire "to work up a sensation;" for we suppose that our readers will agree with us in the idea that a man's life is not to be shortened by his own hand.

THE Trustees of West Troy, N. Y., have granted a franchise to the Municipal Gas Company, of Albany, under which the latter may erect poles and string wires for the purpose of lighting the streets of the village by means of arc lamps.

THE Webster Electric Light Company will hereafter operate the plant of the Webster (Mass.) Gas Light Company. Contracts for enlarging the buildings have been awarded to George Corbin. When all the plant additions have been made (these include a new engine and boiler and the installation of a street arc circuit), the electric division will be in position to furnish 80 arcs and 500 incandescents. The Council has authorized the supply of 37 arcs on city account. The capital stock has been increased to $45,000. The management is of the positively progressive sort.

THE special committee on lighting the city of Galveston, Texas, has prepared the proposition which it was authorized to present to the attention of electricians, who are now invited to bid on lighting the city for a term of 5 years from May 3d next. The proposition is as follows: "Bidders are to submit with their proposal a plan of distribution and arrangement for the street lighting, and to specify the kind, amount, and power of the lights they wish to furnish for streets, and for indoor lighting of city buildings. Separate bids are invited for the furnishing and installation of an electric light plant, suitable to light the city and city buildings, the bidders to furnish the complete outfit, except the ground and the necessary buildings for the station, to guarantee their machinery, as well as the cost of the yearly running expenses, of so much per light per hour, for the term of 5 years, and to receive payment for the said plant in five yearly installments. Efficiency, amount, and good distribution of lighting compared to the total yearly cost (of which the committee shall be the judge), shall be the main features for consideration, and the committee reserves the right to accept any one of the bids or to reject all of them. Bids to be received on or before the 5th day of January, 1889, at 10 o'clock A.M. Address bids to J. Reymershoffer, Chairman of Special Light Committee, at City Hall, Galveston, Tex."

DURING the months of September and October the Messrs. Connelly, of this city, made shipments of their specialties to gas companies at the following points. Sponge was sent in carload lots to Philadelphia (12 cars), Chicago (10), Brooklyn (4), Equitable N. Y. (2), and single carloads to Charleston, S. C., and Davenport, Iowa. Bushel quantities were taken by Tacony (Pa.), 450; Clifton (S. I.), 400; Woburn (Mass.), 350; Jeffersonville (Ind.), 300; Napa City (Cal.) 200; Chillicothe (O.), 150; Roanoke (Va.), 100; Tallahassee (Fla.), 100; Manayunk (Pa.), 100; Canton (O.), 100; Clearfield (Pa.), 80; Watertown (N. Y.), 80; Dunkirk (N. Y.), 60; Perth Amboy (N. J.), 50; Carson City (Nev.), 50; Ashland (O.), 50; Tiffin (O.), 50; Attleboro Falls (Mass.) 50; Orange (N. J.), 50. Automatic governors were taken by Pac. Gas Imp. Co., S. Francisco, Cal., a 20-inch; 10-inch (one each) to Central Company, N. Y. City; Tacony, Pa., and Wyandotte, Kas.; Steubenville, Ohio, took an 8-inch; and 6-inch instruments went to Tallahassee, Fla., Napa City, Cal., Winfield, Kas., Nyack, N. Y., and Talladega, Ala. A steam-jet exhauster was sent to Alton, Ills. In the last annual report concerning the operations of the Philadelphia gas works in 1887, we notice that Chief Engineer Park, as the result of the partial attempt to purify with Connelly sponge, recommends that the material be employed in all the stations of the city gas works.

Artificial Portland Cement.

The unadulterated artificial Portland of commerce is a chemical product in which pulverized chalk or limestone is intimately mixed with such a quantity of pulverized clay as will produce, when calcined at white heat, semi-vitreous but not entirely melted clinkers which, when pulverized and hydrated, harden under water. Being entirely under the control of the manufacturers, the Portland cements are less variable than the natural cements.

According to Dr. Michaelis, the foremost cement expert now living, the raw materials, when dried at 212° F., consist essentially of 75 to 79 per centum (by weight) of carbonate of lime and 24 to 20 per cent. of silicate of alumina (clay). These, when burned, represent 62½ to 67 per cent. of lime and 33½ to 29 per cent. of silicates (silica, alumina, oxide of iron), leaving 4 per cent. for accessories. After the hardening of the hydrated cement a transformation, by complicated reactions, has taken place into hydrated silicate of lime, as the most important ingredient, in hydrated aluminate of lime, ferruginous lime, hydrate of lime, basic sulphate of lime, and carbonate of lime.

Some of the phases during the burning, as well as during the hardening process, are of interest and importance.

The constituents being pulverized, are mixed into a homogeneous paste, balled, dried and burned by exposure to a quick white heat, equal to the melting point of wrought iron. This causes first the expulsion of the chemically bound water and carbonic acid, and next a softening of the whole mixture. During the calcination alumina and oxide of iron, which acted in the clay as bases, assume the role of acids toward the lime, the calcined oxide of iron acting as a flux in the fire. A preponderance of alumina favors the production of a quick-setting cement whilst an increase of iron has the opposite effect, since it arrests the eager absorption of water by the lime which causes it to swell.

When partial vitrification sets in the heat is promptly stopped, since a higher heat or a continued oxidizing heat of the normal temperature will ruin the cement which now requires rapid cooling as much as it did a quick heat before. At this stage the softened lime is alloyed with the softened clay, while neither is in fusion yet. A disposition for the formation of new combinations of lime, with silica, alumina and oxide of iron is induced without allowing these nascent combinations to be fully consummated, because they, as crystalline bodies, would impede the subsequent hydration, and the dense interlocking of the molecules during the setting or crystallization processes. Under these conditions the lime, though not chemically combined, is engaged and kept out of harm's way.

The high temperature of the kiln has gradually condensed the mass and most prominently the silica. The globular texture attained in moderate heat was simultaneously transformed into a laminated semi-vitreous texture.

The Portland cement owes its high reputation largely to such physical changes. Globular texture makes contact by points, while laminated texture achieves more intimate contact by surfaces. In our case it secures in strata of height 50 per cent. more cementing substance than a mass of globular particles.

This close packing intensifies cohesion, of which the high tensile strength is the exponent. After cooling the clinkers are ground to impalpable, dense, drossy, steel-hard powder, having a specific gravity of 3.0 to 3.15. A few weeks' storage seasons the product and makes it ready for use.

MR. CHAS. H. VAN AUKEN, Assist. Supt. of the Cohoes (N. Y.) Gas Light Company, is now a Benedict, having been admitted to the ranks because of his marriage (on Nov. 21) to Miss Mary Watson, a charming and accomplished lady. May good luck attend them.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Somerville Defines his Position in Respect to Self-Sealing Lids.

ENGINEER'S OFFICE,
INDIANAPOLIS GAS LIGHT AND COKE CO.,
INDIANAPOLIS, IND., Nov. 23, 1888.

To the Editor AMERICAN GAS LIGHT JOURNAL:

Your correspondent "W. M." has entirely misunderstood my remarks regarding self-sealing lids, hence his rather discourteous criticism. I did not say or imply that there was any difficulty in the use of self-sealing lids. No one with any knowledge of the subject could make such an assertion. The difficulty which appears to me to be insurmountable is in the making of a good self-sealing lid; and I described the duty required from such a lid.

The best minds in the gas profession have been engaged upon this problem for many years, as the records of the Patent Office will testify; and "W. M." himself is clearly of this opinion, for he goes on to describe how a perfect self-sealing lid *ought* to be made. If he or any other can improve upon the present lid, or free it from the imperfections which I endeavored to point out, the object I had in view in drawing attention to the subject will be accomplished; and, I may also add, there is money in it.

Yours, JAS. SOMERVILLE.

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AGENTS.

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Germany.—B. WESTERMANN &CO., of New York.

MONDAY, DEC. 3, 1888.

The Market for Gas Securities.

The managers of the Consolidated Gas Company declared (on Wednesday, Nov. 28) a semi-annual dividend of two per cent., which is payable on and after Saturday, December 15. The failure to increase the rate caused much disappointment; for the financial guessers were all in accord this time in expressing the belief that at least 2½ per cent. would be awarded out of the earnings for the past six months, which we have reason to believe exceeded 3 per cent. To-day (the books are closed to reopen on the 17th) the stock is selling at 78½, dividend off, which is somewhat of a decline—about ¾ per cent. from quotation in our last. Equitable is a trifle unsteadier, although but little of the stock is offered. Mutual is also in a ragged condition, but we doubt whether a sharp advance on the bid rates would result in a transfer. Over in Brooklyn values are steadily hardening, and we expect to witness a continuance of this pleasant state of affairs. Certainly, old Brooklyn and Nassau look very inviting from a speculative point of view. Chicago Trusts are up and down, with possibly the latter being the most prominent. We understand that the listing committee of the Exchange will agree to list the shares regularly, the trading that has hitherto been done in them being confined to what is known as the miscellaneous list. We have no advices from Boston that tend to show the making of progress in the possible investment of English capital in the gas business of that section. The general outlook in the East is of the brightest character, the reports concerning the increase in sendout showing a decided gain over those presented at this time last year. Baltimore Consolidated is moving upward again, the rise being traceable to a well-defined impression that the probability of a dividend return is not so far off. Cincinnati shares are quoted at somewhat lower figures, while St. Louis shares are firmer. California quotations are in favor of the investor. Mention of the Golden State recalls the fact that we had a very pleasant visit the other day from Mr. Eastland, who is largely interested in the Oakland and Stockton Companies. He is a very firm believer in the value of these properties. Mr. E., who had just returned from his annual hegira to Europe, does not speak in very glowing terms of the European Welsbach burner, nor is he enthusiastic in his remarks regarding the great financial returns that are being gathered in by its European promoters.

Oil Fuel and Insurance.

The *American Manufacturer*, in editorially commenting on this subject, says that the recent action of the underwriters of Chicago in handicapping the use of oil as a fuel by imposing such heavy rates of insurance upon establishments in which it is used is neither justified nor sensible.

The indiscriminate way in which they have levied their rates is altogether unbusinesslike. When firms have taken every necessary precaution in the use of oil to reduce the chance of fire to a minimum, as some have done in Chicago and elsewhere, they should certainly have some consideration from the insurance companies over those who recklessly use it. But such we understand is not the case, the rates of insurance being proportionately the same to all who use such fuel.

The Board of Underwriters in Chicago having convinced the Mayor, the Commissioner of Public Works, and the Chief of the Fire Department that the use of fuel oil is dangerous, have received assurances that permits will not be issued for it indiscriminately; upon the strength of which they adopted a rule that no risk on property should be taken where fuel oil was used, unless the owner had a permit from the Commissioner of public works and the building had been inspected by the Superintendent of Survey of the Board of Underwriters, and even then only at an advance of one per cent. on the regular rates. A provision in the rule adopted states that an agent may write a policy, under all proper restrictions, when the fuel oil used is 300 per cent. proof; but oil of that kind is not used for fuel. An ordinance has also been introduced into the City Council to regulate the distribution of fuel oil within the city limits; but, pipe lines not being contemplated within the city as yet, such legislation is only anticipatory.

This increased rate of insurance which is proposed to be enforced on manufacturers will militate very strongly against the further adoption or continued use of such fuel, as it will wipe out the advantrge over coal which was the inducement to people to use it. Oil was used in the Leland Hotel with perfect satisfaction to the proprietor and all concerned, but was abandoned on account of the one per cent. increase in insurance.

Other firms are contemplating the advisability of following suit. Although insurance companies should reasonably protect themselves, they should not take an undue advantage, nor lay themselves open to the charge of endeavoring to secure extra profits from their customers under the cover of an assumed danger, when experts maintain that the risks undertaken are not extra hazardous.

Some manufacturers state that they have erected storage tanks free from the possibility of explosion, locating them away from all buildings and inclosing them in brick walls. They have also perfected their appliances so as to make them work almost without hitch or nuisance. It is to be hoped that insurance companies will not stand in the way of progress—it is to their ultimate interest to contribute to it—and will not drive firms back to the use of coal which is neither so economical nor efficient.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 WALL ST., NEW YORK CITY.

DECEMBER 3.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	78½	—
Central	440,000	50	—	60
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	115	120
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	99	100
" Bonds	1,500,000	1000	101	103
Municipal, Bonds	750,000		—	—
Northern	125,000	50	39	—
" Scrip	108,000			
Yonkers		50	90	100
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	103	105
Citizens	1,200,000	20	52	55
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	133	135
" Bonds	300,000		—	106
Peoples	1,000,000	10	74	75
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	87	90
Nassau	1,000,000	25	100	103
" Ctfs	700,000	1000	98	100
Williamsburgh	1,000,000	50	124	125
" Bonds	1,000,000	—	111	112
Out of Town Gas Companies.				
Boston (Mass.) Gas Co	2,500,000	500	200	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	—	—
" " Bonds	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	34¾	35½
Cincinnati G. & C. Co.	6,000,000	100	187½	188¾
Consumers Toronto	1,000,000	50	192	—
Central, S. F., Cal.			—	90
Capital, Sacramento, Cal.			58	—
Consolidated, Balt.	11,000,000	100	48½	49
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	—	138
Jersey City	750,000	20	165	170
Lacledé, St. Louis, Mo.	2,000,000	100	115	117
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	207	—
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds	240,000	100	103	—
New Haven, Conn		25	193	197
Oakland, Cal.			33	33½
Peoples, Jersey City		—	60	61
" " Bonds			—	—
Paterson, N. J.		25	90	—
Rochester, N. Y.		50	75	80
Syracuse, N. Y.	500,000	25	—	—

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 408
Wm. Henry White, New York City ... 402
Wm. Mooney, New York City ... 408
William Gardner, Pittsburgh, Pa ... 408
Fred. Bredel, N. Y. City ... 407

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills. ... 402
American Gas Improvement Co., Pittsburgh, Pa ... 402
Bartlett, Hayward & Co., Baltimore, Md ... 399
Wm. Henry White, N. Y. City ... 402
United Gas Improvement Co., Phila., Pa ... 401
Henry Pratt & Co., Chicago, Ill ... 410

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City ... 364
R. D. Wood & Co., Phila., Pa ... 410

GAS GOVERNORS.

Connelly & Co., New York City ... 403
R. K. Huntoon, Franklin, Mass ... 357
Fred. Bredel, N. Y. City ... 407
Friedrich Lux, London, England ... 396

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page, N. Y. City ... 400

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y ... 406
H. W. Johns Manufacturing Co., N. Y. City ... 398

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio ... 412

GAS METERS.

Harris, Griffin & Co., Phila., Pa ... 414
American Meter Co., New York and Philadelphia ... 415
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa ... 415
Helme & McIlhenny, Phila., Pa ... 415
D. McDonald & Co. Albany, N. Y ... 415
Nathaniel Tufts, Boston, Mass ... 414
Maryland Meter and Manufacturing Co., Baltimore, Md ... 414

EXHAUSTERS.

P H. & F. M. Roots, Connersville, Ind ... 397
Smith & Sayre Manufacturing Co., New York City ... 411
Wilbraham Bros., Philadelphia, Pa ... 403
Connelly & Co., New York City ... 403

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 413
Perkins & Co., New York City ... 412
Newburgh Orrel Coal Co., Baltimore Md ... 413
Despard Coal Co., Baltimore, Md ... 413
Chesapeake and Ohio R.R. Coal Agency, N. Y. City ... 413
Westmoreland Coal Company, Phila., Pa ... 413
Monongahela & Peters Creek Gas Coal Co., Pittsburgh, Pa ... 413
Cannelville Coal and Iron Co., Chicago, Ills ... 413

CANNEL COALS.

Perkins & Co., New York City ... 412
J. & W. Wood, New York City ... 412

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City ... 411
T. F. Rowland, Greenpoint, L. I ... 411
Delly & Fowler, Phila., Pa ... 411
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 410
Stacey Mfg. Co., Cincinnati, Ohio ... 411
Bartlett, Hayward & Co., Baltimore, Md ... 399
Morris, Tasker & Co., Limited, Phila., Pa ... 397
Davis & Farnum Mf'g Co., Waltham, Mass ... 409
R. D. Wood & Co., Phila., Pa ... 410
Bouton Foundry Co., Chicago, Ills ... 411
Smith & Sayre Manufacturing Co., New Yotk City ... 411
Fred. Bredel, N. Y. City ... 407
United Gas Improvement Co., Phila., Pa ... 401
Henry Pratt & Co., Chicago, Ill ... 410
National Gas Light and Fuel Co., Chicago, Ills ... 402

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa ... 408
Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) ... 408
Ohio Pipe Co., Columbus, Ohio ... 408
M. J. Drummond, New York City ... 408
Wells Rustless Iron Co., New York City ... 408
R. D. Wood & Co., Phila., Pa ... 408
Warren Foundry & Machine Co., New York City ... 408
Donaldson Iron Co., Emaus, Pa ... 408
Dennis Long & Company, Louisville, Ky ... 397

PURIFYING MATERIAL.

Connelly & Co., New York City ... 403
Friedrich Lux, London, England ... 396

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J ... 406
B. Kreischer & Sons, New York City ... 406
Adam Weber, New York City ... 406
Laclede Fire Brick Works, St. Louis, Mo ... 406
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y ... 406
Borgner & O'Brien, Phila., Pa ... 406
James Gardner, Jr., Pittsburgh, Pa ... 406
Henry Maurer & Son, New York city ... 407
Chicago Retort and Fire Brick Co., Chicago, Ills ... 407
Baltimore Retort and Fire Brick Co., Baltimore ... 406
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo ... 406
Emil Lenz, New York City ... 406

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 399
Fred. Bredel, New York City ... 407
Chicago Retort and Firebrick Co., Chicago, Ills ... 407
H. C. Hann, Baltimore, Md ... 398
Wm. Henry White, N. Y. City ... 402

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 404
John McLean, New York City ... 404
Chapman Valve Manufacturing Co., Boston, Mass ... 404
R. D. Wood & Co., Phila., Pa ... 410

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa ... 380
Clerk Gas Engine Co, Phila., Pa ... 404

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass ... 403
Ball Engine Co., Erie, Pa ... 397

GAS LAMPS.

The Siemens-Lungren Co., Philadelphia, Pa ... 409
G. Shepard Page, New York City ... 404
Albo-Carbon Light Co., Newark, N. J ... 403
Standard Gas Lamp Co., Phila., Pa ... 398
U. S. Wenham Pat. Gas Lamp Co., New York City ... 361

PURIFIER SCREENS.

John Cabot, New York City ... 404
Geo. A. Mills, Baltimore, Md ... 404

GAS STOVES.

American Meter Co., New York and Philadelphia ... 405
The Goodwin Gas Stove and Meter Co., Phila. Pa ... 416
Dinsmore Manufacturing Co., Boston, Mass ... 398

STREET LAMPS.

J. G. Miner, Morrisania, New York City ... 362
Bartlett Street Lamp Mf'g Co., New York City ... 398

BURNERS.

C. A. Gefrorer, Phila., Pa ... 412

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City ... 398

GASHOLDER TANKS.

W. C. Whyte, New York City ... 399

GASHOLDER PAINT.

H. W. Johns Manufacturing Co., N. Y. City ... 398

COKE CRUSHER.

C. M. Keller, Columbus, Ind ... 413

ELECTRICAL APPARATUS.

Waterhouse Electric & Manufg Co., Hartford, Conn ... 398
Wm. Henry White, N. Y. City ... 402

BOOKS, ETC.

Goodwin's Directory of Gas Light Companies ... 407
King's Treatise ... 408
Scientific Books ... 414
Management of Small Gas Works ... 404
Gas vs. Electricity ... 406
Practical Electric Lighting ... 403
Electric Light Primer ... 403
American Gas Engineer and Superintendents' Handbook ... 397

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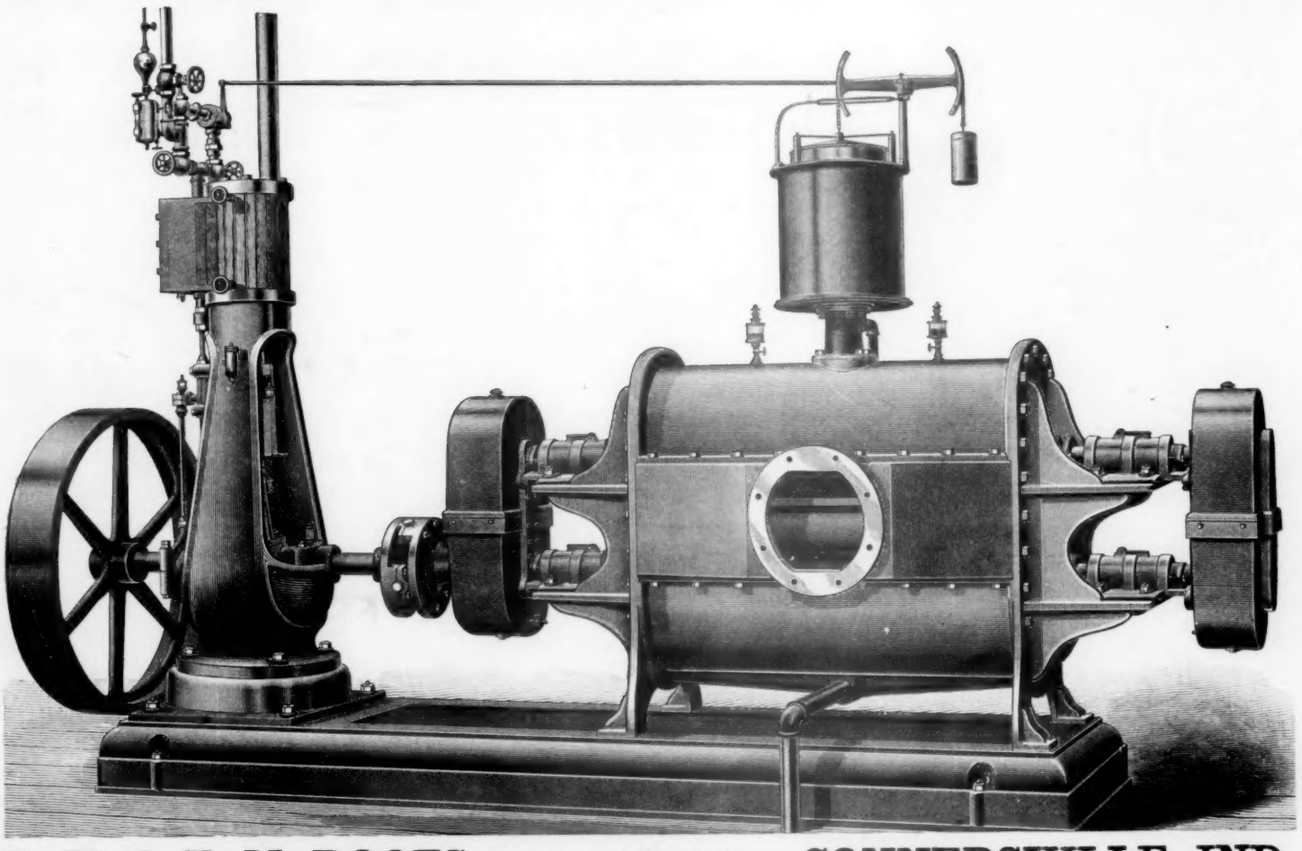

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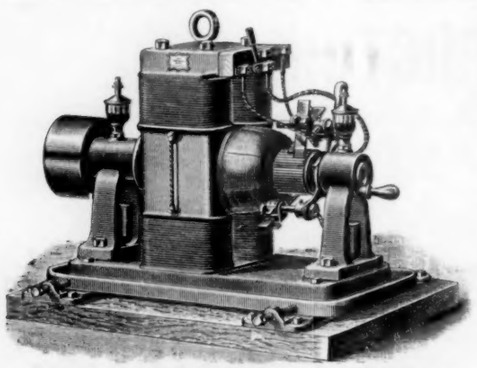

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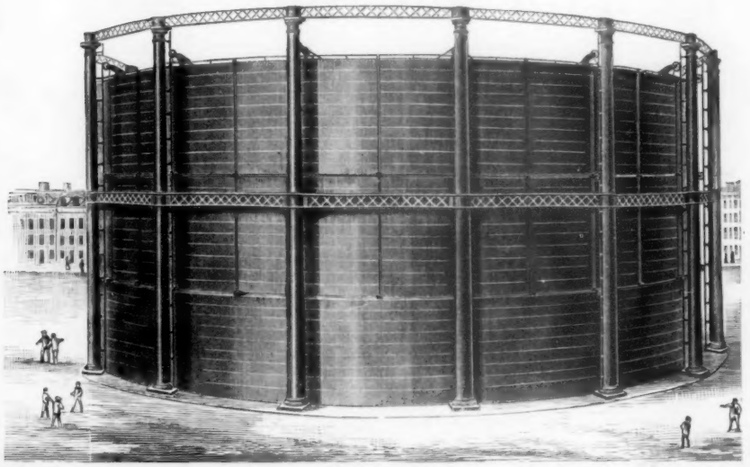

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No. 3,	"	"	250,000	"	"	"	5	"	"	" "
No. 4,	"	"	500,000	"	"	"	6	"	"	" "
No. 5,	"	"	750,000	"	"	"	7	"	"	" "
No. 6,	"	"	1,000,000	"	"	"	8	"	"	" "
No. 7,	"	"	1,250,000	"	"	"	9	"	"	" "
No. 8,	"	"	1,500,000	"	"	"	10	"	"	" "
No. 9,	"	"	2,000,000	"	"	"	12	"	"	" "
No. 10,	"	"	3,000,000	"	"	"	15	"	"	" "

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

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Elkhart Gas Light and Coke Co.	Elkhart, Ind.
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San Diego Gas Fuel and Electric Lt. Co.	San Diego, Cal.
Jackson National Gas Co.	Jackson, Mich.
Sioux Falls Gas Co.	Sioux Falls, Dak.
Dakota Gas and Fuel Co.	Grand Forks, Dak.
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Stillwater Gas Light Co.	Stillwater, Minn.
St. Paul Gas Light Co.	St. Paul, Minn.
Emporia Electric and Gas Light Co.	Emporia, Kas.
Van Wert Gas Light Co.	Van Wert, Ohio.
Lansing Gas Light Co.	Lansing, Mich.
San Francisco Gas Light Co.	San Francisco, Cal.
Shelbyville Gas Light Co.	Shelbyville, Ind.
Great Falls Gas Light Co.	Great Falls, N. H.
Belleville Gas Co.	Belleville, Ontario.
Rochester Light and Fuel Co.	Rochester, Minn.
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Beaver Falls Gas Works, H. F. Dillon, Supt.
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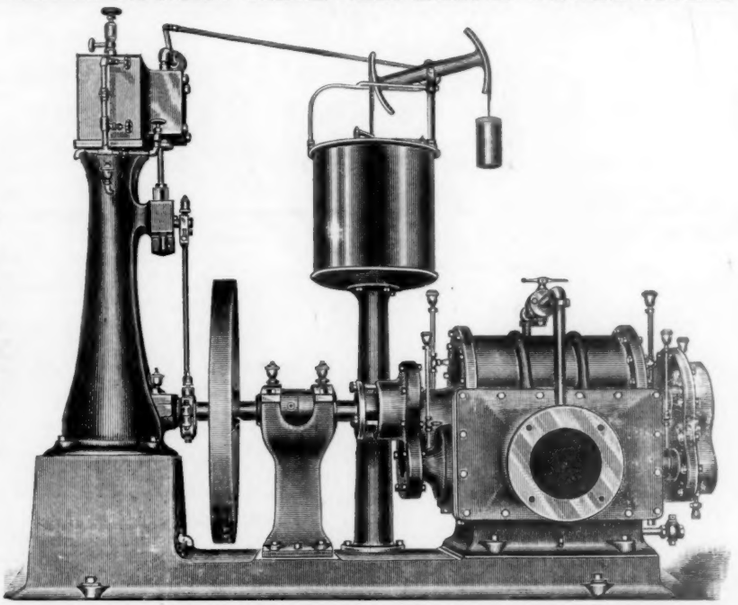

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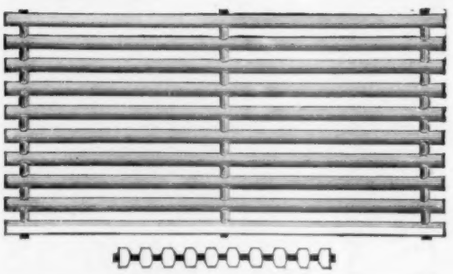

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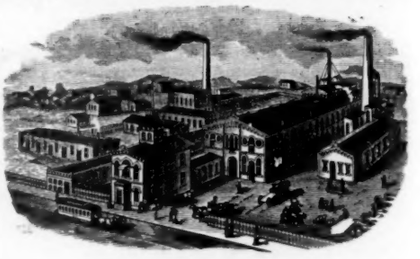

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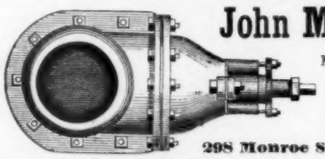

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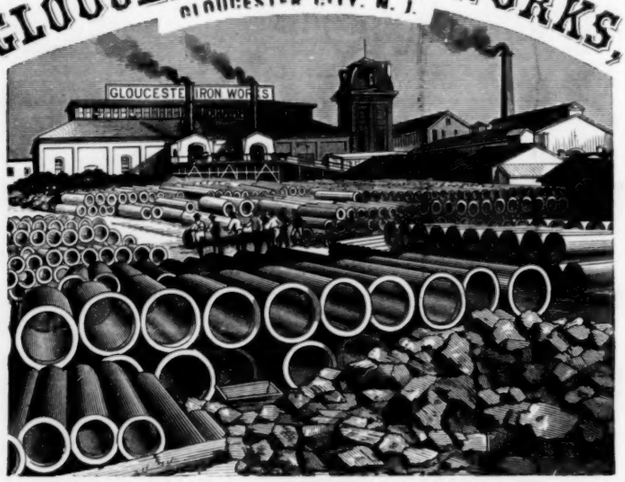

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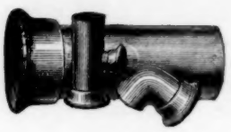

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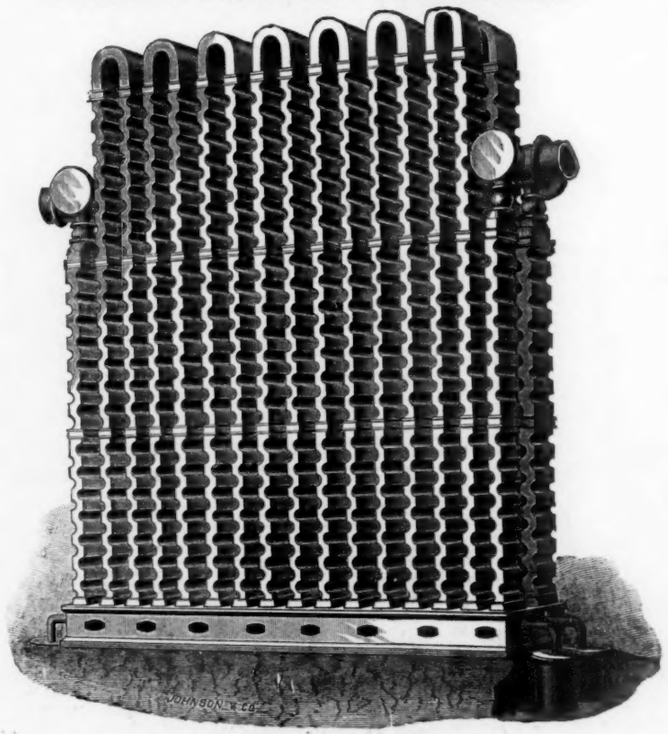

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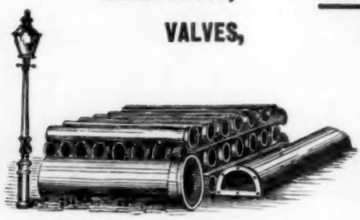

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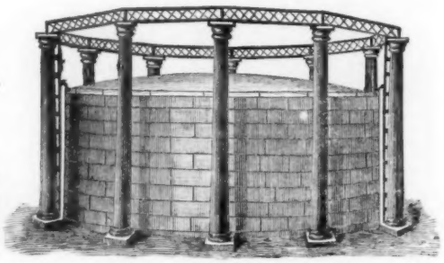

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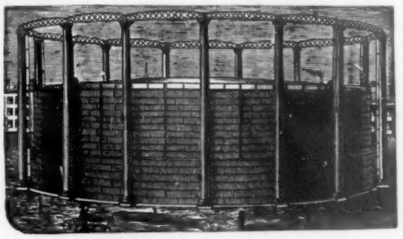
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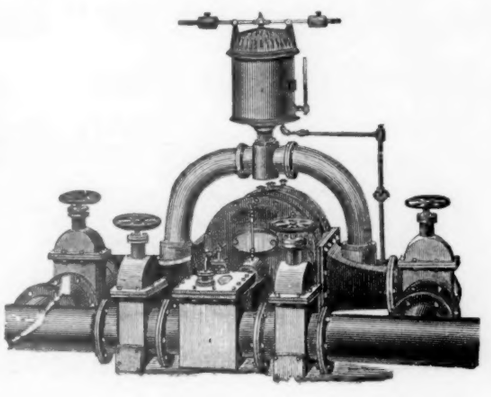

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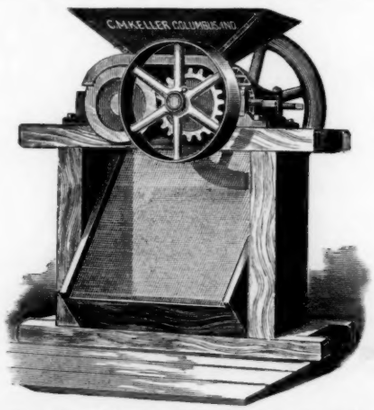

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37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.
Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.
The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

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31 in. high.	9⅛ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

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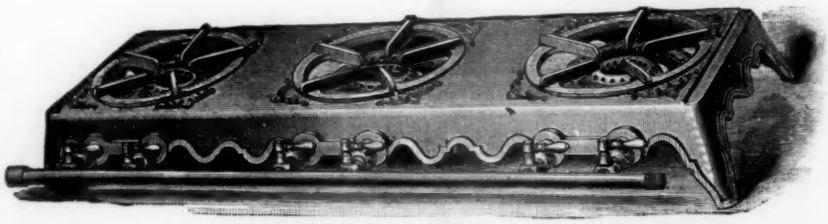
Size, 6¼ inches diameter, 8 inches high. Consumption, 6 feet per hour at 1 in. pressure.



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Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.
Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.
½ in. supply pipe should be used where the pressure is 1 in. or over.